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Supplying unprecedented customer demands in the face of many raw material shortages is today's big challenge to the Chemical Industry. A "tight squeeze" is being felt all around, and each producer is working hard to overcome his particular part of the problem.

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The Armed Forces Chemical Journal is the official publication of the Armed Forces Chemical Association. The fact that an article appears in its columns does not indicate the approval of the views expressed in it by any group or any individual other than the author. It is our policy to print articles on subjects of interest in order to stimulate thought and promote discussion; this regardless of the fact that some or all of the opinions advanced may be at variance with those held by the Armed Forces Chemical Association, National Officers, and the Editors.

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COVER PHOTO

Mr. G. M. Glidden, President of the Chicago Chapter, is presented with the AFCA Plaque by President Walter E. Lawson, at Chicago. See also, pictures of awards on page 38.

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EDITORIAL

A CALCULATED RISK

A serious problem is posed by the situation of thousands of reservists, officer and enlisted, whose employment status is deeply affected by the fact that they are subject to call to duty at short notice, but who cannot learn *when* they will be called to active duty, or even *if* they will be called.

Many of these men are reportedly unable to find suitable employment because prospective employers are unwilling to risk hiring them in the face of the likelihood that they might be called to active duty just when they are most needed, or after an employment period so brief that it would not warrant the time spent training them.

Others are employed but are, according to some reports, being denied promotion to better jobs, for the same reasons.

These men have all voluntarily joined the reserve forces for the most patriotic and praiseworthy reasons, and their reward is to suffer a grave economic handicap.

A great many employers, including most of the large corporations, have established employment and promotion policies which avoid this discrimination against reservists. They have voluntarily assumed the hazards of the uncertain status of these men, for the same patriotic reasons that actuated the men in joining the reserve.

But there are apparently many employers who feel that they simply cannot undertake such risks, perhaps because of contractual obligations that would make it unsafe to subject their organizations to the dangerous loss of key personnel at a critical time. In the case of large corporations it may be that *some* subordinate officials, seriously concerned with the problem of maintaining their staff in order to get the job done, are not rigidly applying the top level policy of not discriminating against personnel in employment and promotional practices.

Who is to blame for this situation? The victims probably divide their criticism between the employers and the Armed Services. The Defense Department, greatly disturbed by the problem but unable, so far, to come up with an adequate solution, must certainly feel that the real villain in the piece resides in the Kremlin.

Mr. Stalin has succeeded in creating a world situation which has made it virtually impossible for the Defense Department to create and execute a firm and systematic manpower program. Between the unpredictable uncertainties of the external situation, and the unsteady pressure of our internal economy and the national legislative body, the Department of Defense has been unable to set up such a stable and regulated program for military mobilization as would enable our reservists to secure a reasonably accurate estimate as to when they could expect to pass from reserve to active duty.

What can be done about it? The most immediate and practical solution seems to be for employers generally to assume a greater share of the burden and risk of meeting the employment needs and rights of these reservists, wherever and whenever it is by any means possible to do so. They should assume this as a calculated risk; justified by the genuine need for uplifting and supporting the morale of these reservists, and more particularly by the necessity that these men receive justice at the hands of the country they have pledged themselves to serve.

And where the local situation makes such employment quite impossible, it would seem needful and expedient that the Armed Services stand ready to remedy hardship cases by accepting such men for immediate active duty, where such action would meet the needs and the wishes of the reservist.

The JOURNAL is aware of the reality and validity of this problem, but has less information upon how extensive and widespread it may be. In any case, with the increased tempo of mobilization it can be assumed that the problem will largely disappear. Certainly, much fact-finding and study is indicated if an adequate plan to combat its recurrence is to be found.

GAS WARFARE

The editorial in the last issue of the JOURNAL *has provoked a number of letters of comment, as had been hoped. These letters follow. An exceedingly interesting and provocative letter from Colonel E. R. Baker, CmlC USAR, was received recently with a presentation of his views on chemical warfare in Korea. This letter was circularized to our directors, and a number of comments upon Colonel Bakers letter, which follows, are also presented.*

CHEMICAL WARFARE IN KOREA

1. The United States, together with all other democratic countries, is now openly and irrevocably engaged in combat with the Communist powers. This combat has developed through the cold war stage into the hot war stage and is just short of the ultimate conflagration which will be known as World War III.

2. The democracies currently are superior to the communists in every material respect militarily except manpower. Here the disparity is so heavily weighted, however, in favor of the Reds as to appear overwhelming. It is obvious that we must utilize every other superiority we have if we are going to overcome this enormous horde successfully. Time is, for once, not on our side. We must strike quickly and powerfully to destroy or render impotent the inexhaustibly onrushing armies of men.

3. On examination of ways and means by which the democracies may surely achieve a victory over an enemy of such numerical superiority leads one to the inescapable conclusion that we must employ all known methods of anti-personnel warfare. Destruction of material is useless. The Reds are so dispersed in area that it would be an impossible task to destroy even a fraction of their industrial and war-making potential. We must fight their armies with much fewer men, but with correspondingly greater fire-power, mobility, intelligence, and particularly with the most effective weapons.

4. Weapons for anti-personnel warfare include the usual ones such as rifles, machine guns, grenades, artillery and fragmentation bombs. But over and far above these are two types of weapons peculiarly suited for this kind of warfare. These are flame and chemical weapons. Flame can destroy material but its primary usefulness is against men. Its use, however, is not new and flame warfare is currently being employed with glowing success. Why should not we also utilize the other proven anti-personnel weapons, those of chemical warfare?

5. An imposing list of arguments can be marshalled in favor of the immediate full-scale use of chemical weapons against the enemy in Korea or wherever else we meet him.

1. It provides the most effective proven anti-personnel weapons.
2. We have by far the world's largest capacity for chemical production and currently have large stocks on hand.
3. Our defense against chemicals is more than adequate.
4. The enemy's defense against chemicals is practically nil.
5. Our air superiority permits the use of optimum methods such as low altitude spray and use of large non-persistent bombs.
6. The psychological effect of "gas" is an added value.
7. It is the most humane method of warfare known.

Finally, the use of mustard, lewsite and phosgene in the vast quantities which we are capable of making and distributing offers the only sure way of holding Korea at the present time. We are not playing marbles. We are fighting for our lives. Let's use the best means we have to overwhelm the enemy scientifically and intelligently.

E. R. BAKER, *Col.*, CmlC Res.

Dallas, Texas

It would seem that historically, certainly since the turn of the century, U. S. foreign policy, backed by U. S. public opinion, has followed a course of strictly defensive planning, of attempting to "walk softly but carry a big stick." The difficulty has been that in peace time the stick gets heavy, and we lay it down. This has cost us dearly in men and goods.

(Continued on Page 54)

Fellow Members of Armed Forces Chemical Association:

I am writing to invite you to the Sixth Annual Meeting of the Armed Forces Chemical Association. Those of us connected with plans for this meeting believe it will live up to past performances and therefore surpass all previous meetings. That becomes harder to do each year. The details of the meeting, the general assembly for talks by outstanding men of this country, the cocktail parties, and the banquet have been described to you. I want simply to emphasize that many of your friends from our one hundred twenty Group Members will be there. It will be a meeting you can not afford to miss, and it will be a meeting that you should want to attend. Come prepared to listen, to talk on topics of interest, and to play. Your Executive Committee extends its heartiest welcome.

Walter E. Lawson, President

AFCA ANNUAL MEETING

ATLANTIC CITY, MAY 10-11-12

The Sixth Annual Meeting of the Armed Forces Chemical Association may well prove to be the most successful such meeting we have yet held.

These are momentous times, and the theme of the meeting, Industrial Mobilization, is one that deeply affects every member of our Association. The program is planned to be an enlightening one, and everyone who attends can expect to get much out of the meeting. It is no less true that every one who attends is capable of contributing something to its success. A distinctly worth-while program is planned and every member who can possibly manage to make the affair is urged to do so.

The current Annual Meeting was originally planned to have been held at an Air Force Base, in accordance with the policy of rotating our meetings among the Army, Navy and Air Force. The stresses of the national emergency made it inadvisable to ask the Air Force to entertain us at one of their bases this year, but the meeting is still dedicated to the Air Force. The principal speaker at the banquet, will be Lieutenant General I. H. Edwards, Deputy Chief of Staff, Operations, U. S. Air Force. It is expected that his address will cover the general military situation as of that time.

General Anthony McAuliffe, Chief Chemical Officer, will be the principal speaker at the afternoon session of the Annual Meeting. As final arrangements with the other scheduled speakers have not yet been completed as this is written, it can only be stated that the arrangements call for coverage in their talks of specific fields of very great interest, and that a most distinguished group of speakers, each a "top" man in his field.

The place is expected to contribute to the success of the Meeting. Atlantic City is readily accessible to a vast number of our members; the majority of our membership are within a few hours drive or a brief trip by train. The resort is at its best at this time of year. The meeting can blend in with a delightful week end. Most of us are working under considerable pressure these days; a short interlude of relaxation combined with the important purposes of the Annual Meeting should provide a very strong incentive indeed to come to Atlantic City on May 10th.

If you have not yet sent in your reservation for the Annual Meeting we hope you will do so at this time. The hotel reservation should be made direct to the Hotel Claridge, Atlantic City, New Jersey. Your registration form (sent to you in a recent letter) should be sent to National Headquarters, Room 523, 1129 Vermont Avenue, N. W., Washington, D. C. It will be helpful if on your registration form you will indicate that you have already made your hotel reservation. If you do not have the form at hand, send us a letter indicating that you will be present. The registration fee is $15.00 per person, which should be sent in with your advice of your intention to attend.

THE PROGRAM

May 10th—
Registration and impromptu activities
5:30 p.m. to 6:30 p.m. Cocktail Party
8:00 p.m. Directors' Meeting
Optional: There will be Dancing from 10 p.m. to 1 a.m.

May 11th—
10:00 a.m. Annual Meeting
2:00 p.m. Industry-Defense Department Symposium
6:30 p.m. Cocktail Party
8:00 p.m. Banquet
Optional: There will be Dancing from 10 p.m. to 1 a.m.

May 12th—
Departure.

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Affiliated Gas Equipment, Inc., Cleveland, Ohio
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Allied Chemical & Dye Corporation, New York, N. Y.
American Aniline Products, Inc., New York, N. Y.
American Cyanamid Company, New York, N. Y.
American Stove Company, St. Louis, Mo.
American Zinc, Lead & Smelting Company, St. Louis, Mo.
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Atlas Powder Company, Wilmington, Del.
Baker & Company, Inc., Newark, N. J.
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Bechtel Corporation, San Francisco, Calif.
Bird Machine Company, S. Walpole, Mass.
Blaw-Knox Construction Co., Pittsburgh, Pa.
The Bolta Company, Lawrence, Mass.
Bridgeport Brass Company, Bridgeport, Conn.
Brown Company, Berlin, N. H.
Buffalo Electro-Chemical Company, Inc., Buffalo, N. Y.
The H. O. Canfield Company, Bridgeport, Conn.
Casco Products Company, Bridgeport, Conn.
Celanese Corporation of America, New York, N. Y.
The Central Foundry Company, New York, N. Y.
Crown Can Company, Philadelphia, Pa.
Diamond Alkali Company, Cleveland, Ohio
Dow Chemical Company, Midland, Mich.
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Empire Stove Company, Belleville, Ill.
Esselen Research Division, Boston, Mass.
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Glyco Products Company, Inc., Brooklyn, N. Y.
B. F. Goodrich Chemical Company, Cleveland, Ohio
Goodyear Tire & Rubber Company, Akron, Ohio
Gray Stamping & Manufacturing Co., Plano, Ill.
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The Emil Greiner Company, New York, N. Y.
Gulf Oil Corporation, Pittsburgh, Pa.
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Handy & Harman, New York, N. Y.
The Harshaw Chemical Company, Cleveland, Ohio
The Heil Company, Milwaukee, Wis.
Hercules Powder Company, Wilmington, Del.
Heyden Chemical Corporation, New York, N. Y.
Hooker Electrochemical Company, Niagara Falls, N. Y.
The Howell Co., St. Charles, Ill.
Industrial Rubber Goods Company, St. Joseph, Mich.
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Stauffer Chemical Company, New York, N. Y.
Stewart Die Casting, Chicago, Ill.
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Zenite Metal Corp., Indianapolis, Ind.
Zenith Plastics Company, Gardena, Calif.

(Bold Face Type indicates SUSTAINING MEMBERS.)

HERE IS WHAT YOU SHOULD KNOW ABOUT BIOLOGICAL WARFARE

Biological attacks could be made by enemy forces or by secret agents. The attacks could be aimed at people, animals, or food crops. But—biological warfare is no secret super-weapon. There are defenses against it and you should know what they are.

WHAT IS BIOLOGICAL WARFARE?

ATTACKS WITH GERMS, TOXINS AND SPECIAL CHEMICALS ARE CALLED BIOLOGICAL WARFARE

Although many people talk about "germ warfare" the name they should use is biological warfare, or BW for short. Scientists divide biological warfare into three parts. They are:

1. Attacks with "living agents." These are different kinds of small living things which sometimes cause sickness or death in people, animals, or plants. You have seen plant-killing insects at work. You also have heard of bacteria, viruses, and other disease-causing things.

2. Attacks with special kinds of poisons called "toxins." Toxins are poisons produced by some living things. The kinds of toxins most likely to be used in biological warfare come from plant-like germs called bacteria.

3. Attacks with special kinds of chemicals known as artificial hormones. Some people call them "growth regulators." The best known ones are those used to kill weeds and other unwanted plants.

IS BIOLOGICAL WARFARE ENTIRELY NEW?

GERMS HAVE PLAYED A PART IN ALL MAJOR WARS
GERMS WERE USED IN WORLD WAR I
GERM ATTACKS THAT DEPEND ON NATURAL SPREAD HOLD LITTLE DANGER

Even with no help from man, germs have entered every major military campaign. Plague cut down the Crusaders at the gates of Jerusalem. Typhus riddled the Moors in Spain and dysentery thinned the ranks of Napoleon's Grand Army as it moved on Moscow. During the Boer War, typhoid fever laid low more men than did bullets. In the early days of World War II, malaria attacked our own American forces in the South Pacific.

More than once, germs, not generals, have decided the outcome of a conflict. But those were natural germs, naturally spread. Now, our defenses against disease are better than they used to be.

So far, no one has used biological warfare on a large scale. But small-scale attacks have been tried. Before we got into World War I, secret agents working in the United States infected livestock with a disease called glanders as the animals were being prepared for shipment to the Allied Nations of Europe.

Those attacks were very crude. They had no real effect on the outcome of the war in which they were used, since only a few animals were infected. They relied on natural spread to finish the job. Such attacks hold little promise of really sweeping results.

WHY WOULDN'T BW ATTACKS SPREAD ONCE THEY WERE STARTED?

MOST DISEASES SPREAD SLOWLY
WE ALREADY HAVE A PROTECTIVE NETWORK
CAREFUL DISEASE RECORDS ARE KEPT AND FOODS ARE CHECKED FOR PURITY
WAR IS WAGED ON PLANT AND ANIMAL PESTS
EVERY CARE IS TAKEN TO PREVENT THE ENTRY OF DISEASES FROM FOREIGN LANDS

Although disease can spread quickly, most outbreaks move quite slowly. The plague that swept over London in the seventeenth century began with a few cases in the fall of 1664. It took the disease 6 months to cross from one side of the city to the other. The peak of the epidemic did not come until August, 1665.

While almost 70,000 people died of plague, it was not a lightning-quick disaster from which there was no escape. With the public health organizations that now exist, the London outbreak could have been stamped out with little or no loss of life.

Today the United States has a Nation-wide system set up to prevent and control disease outbreaks of all kinds. This safety network covers not only people, but crops and livestock as well.

There are many familiar signs that this protective system is at work. From newspaper stories everyone knows that our health authorities keep careful records of the numbers of cases of polio, mumps, measles, scarlet fever, flu, and other diseases reported each week.

Most of us have seen a city waterworks where drinking water is checked for pollution and purified. In many of our larger cities, signs on the windows show that public

* *Federal Civil Defense Administration Publication PA-2*

restaurants are regularly inspected for cleanliness. The purple-colored stamps on meats bought in neighborhood groceries show that many of our foods are checked for purity before they reach our tables. The bottle caps usually show that our milk has been pasteurized, or that it comes from tested cows.

Throughout the land, we see drainage ditches, DDT spraying, and other proofs that our Nation is warring against rats, mice, mosquitoes, flies, fleas, and other disease-carrying vermin. In driving our cars from State to State, most of us have been stopped at plant quarantine stations. These are set up to keep beetles, blight, and other plant plagues and pests from spreading.

To prevent diseases from being brought in from foreign lands, people coming into our country must pass health examinations. All incoming livestock and plants, as well as meats, hides, and other animal or plant products have to go through rigid inspections. Certain products are barred altogether because they are disease carriers.

HOW WELL DOES OUR SYSTEM WORK?

THERE IS PROOF THAT OUR SYSTEM IS EFFECTIVE

Proof that our safety system works is shown by its record. Diseases such as smallpox and typhoid fever, which caused wholesale epidemics only 50 years ago, are now very rare in this country. Diphtheria, once among the Nations top killers, now hardly shows up at all in our health reports.

Foot-and-mouth disease, which once cut down both our domestic cattle and our wild deer herds, is no longer found inside our borders. At present, representatives of our Government are helping to stamp out the foot-and-mouth disease epidemic that recently broke out in Mexico.

In spite of fears that our troops would bring home dangerous diseases, there were no outbreaks of foreign plagues following the return of our Armed Forces from overseas at the close of the last war.

When a man with smallpox mingled with New York Citys crowds for several days in 1947, more than 6,350,000 people living in the area were vaccinated in a hurry. Only 12 other cases of smallpox resulted.

WHAT ARE THE BIG DANGERS FROM BIOLOGICAL WARFARE?

THE BIG DANGER FROM BW LIES IN NEW METHODS OF SPREADING OLD DISEASES
GERMS CAN BE SPREAD IN ARTIFICIAL MISTS, CALLED AEROSOLS
ALTHOUGH AEROSOLS MAY NEVER BE USED, WE MUST NEVERTHELESS PREPARE DEFENSES AGAINST THEM
INDIRECT TRANSMISSION OF DISEASE IS UNCERTAIN
DIRECT DISEASE TRANSMISSION MAY BE QUICK AND SURE

In spite of our health safety system, BW does hold dangers that we must be prepared to meet. There is little to fear from new kinds of diseases. The big danger to people is in new ways of spreading diseases already known.

When a person coughs or sneezes, tiny drops of moisture are blown from his mouth and nose out into the air. If he is ill, this spray may carry harmful germs. Laboratory workers have found that it is possible to spread disease germs through the air in much the same way—by floating them in fine sprays or mists, technically called aerosols. Bathroom atomizers, DDT bombs and spray guns produce small-scale aerosols.

Much bigger aerosols might be used for major BW attacks. They could be loosed from special sprayers carried in airplanes, if an enemy could succeed in making an attack pretty close to the ground. Or the aerosol machines might be carried aboard submarines.

When disease germs are spread through the air in aerosols, anyone who breathes in any of the mist is very likely to get a number of germs right in his lungs. In that vital spot, germs could easily take hold and cause illness.

So far as we know, the aerosol method of spreading disease germs has never been tried in actual warfare. We don't know whether it ever will be tried. Still, we know it could be used and so we must plan against it just to be on the safe side.

To show the possibilities of germ delivery by aerosols, let's take an example:

If a small bottle of laboratory-grown disease germs was spilled on a factory floor, the bugs would have little chance of getting inside people's bodies where they could cause harm. The best results an enemy could hope for would be that a few of the people in the factory might become sick, and the disease might later spread from them to others.

On the other hand, if the same number of germs were loaded into a spray gun and then blown into the air intake of the factory ventilating system, most of the people in the factory probably would breathe in some of the germs. Many would become infected right away. That is one of the kinds of sabotage our industrial plants will guard against.

HOW ELSE CAN BW ATTACKS BE MADE?

SPECIAL BOMBS MIGHT CARRY BW AGENTS
SABOTEURS COULD POLLUTE FOOD AND WATER SUPPLIES

While germ-filled mists, or aerosols, could be used against us, BW attacks also might be made in other ways. Both germs and toxins could be loaded into specially designed bombs. In that case, the enemy would rely on the explosions to spread the germs or poisons around.

On the other hand, an enemy might prefer to work secretly. He could use fifth columnists to try to pollute factory food and water supplies. Specially trained agents might try to put germs or poisons into city water mains.

Many months before the outbreak of open warfare, undercover workers might try to spread wheat rust in our fields or loose a disease called fowl pest in our poultry flocks. The idea would be to cut down our food supplies. Farmers, poultrymen, and livestock owners will help to guard against such attacks.

Because of these possibilities, we must be on the lookout for BW attacks of all kinds.

WHAT KINDS OF GERMS AND POISONS MIGHT BE USED IN BW?

DIFFERENT GERMS MAY BE USED FOR DIFFERENT PURPOSES
AN ENEMY MIGHT WANT ONLY TO MAKE PEOPLE SICK, NOT TO KILL THEM
THE PURPOSE OF ATTACKS ON LIVESTOCK WOULD BE TO REDUCE FOOD SUPPLIES
NATURAL PLANT DISEASES MIGHT BE USED IN BW

The kinds of germs and poisons which might be used in BW would depend on what the enemy hoped to get out of the attack. If he wanted to kill large numbers of people, he might use plague, typhus, cholera, smallpox, or some

similar disease. But an attacker might want only to make people sick rather than to kill them. That would cripple both our fighting and our production forces. It also would tie up doctors and hospitals. For this purpose, diseases like rabbit fever and undulant fever might be used.

There also are many diseases that could be used to attack the different kinds of animals upon which we depend for both food and clothing. Anthrax, or wool sorters' disease, is one example. Glanders is another.

Fowl pest and Newcastle disease might be used against poultry. Rinderpest, sometimes known as Asiatic cattle plague, might be aimed specially at cattle or sheep, but man and most other animals are immune to rinderpest.

Many kinds of plant plagues and pests could be used to attack food crops. Diseases and insect pests could damage grains and fruits. Blights of different types could harm green vegetables.

Specially prepared chemicals might be used in raids on growing crops. For example, chemical growth regulators could be used to destroy food plants as well as weeds.

The kinds and effects of biological agents that might be used against us are well known to our scientists.

WHAT ABOUT NEW TYPES OF GERMS AND POISONS

TALK OF GERMS KILLING MILLIONS OF PEOPLE AT ONCE IS NONSENSE
BOTULISM IS A SERIOUS TYPE OF FOOD POISONING
BOTULINUS TOXIN IS A POWERFUL POISON, BUT ITS POWER HAS BEEN EXAGGERATED
DISTRIBUTING TOXINS IS VERY DIFFICULT
PEOPLE CAN BE IMMUNIZED AGAINST BOTULISM
GERMS ARE THEORETICALLY MORE POWERFUL THAN TOXINS
NO SINGLE TYPE OF GERMS WILL MAKE EVERYONE SICK
NO GERMS OR TOXINS WILL KNOCK OUT OUR WHOLE COUNTRY
IDENTIFYING BW AGENTS SOMETIMES MIGHT TAKE QUITE AWHILE
EVERYONE MUST COOPERATE IN COLLECTING BLOOD SAMPLES

Forget about new "mystery" germs and poisons.

During the past few years, a great deal of foolish talk has been heard about supposedly new types of germs and poisons so powerful that even a thimblefull could kill millions and millions of people. Most of this is pure scare-talk built on twisted facts. Let's take one example:

There is an unusually serious type of food poisoning that doctors call botulism. Tiny plant-like germs, or bacteria, create very small amounts of an extra-strong poison which may get into the body. Scientists call this poison *botulinus toxin.*

Toxin is the technical name for any poison produced by plants or animals, while *botulinus* comes from the Latin for "sausage-shaped." The poison was given this name both because of the shape of the germs that produce it, and because it was discovered in an outbreak of food poisoning that came from eating bad sausages.

During the last war laboratory workers managed to separate two different types of *botulinus* toxin in almost pure form. To test the killing power of the poison, very tiny doses of it were given to white mice. The experiments showed that 1 ounce of the toxin would be enough to kill about 840 billion mice.

Some dreamer promptly figured by comparing the weight of a human being with the weight of a mouse, that one ounce of botulinus toxin would kill about 220 million human beings—more people than there are in the whole of North America.

Actually, we do not know, pound for pound, whether people could be killed as easily by botulism as mice are. But suppose one ounce of this toxin was enough to kill 220 million people. Also, let's suppose that we had a full ounce of the poison and that all 200 million living North Americans were jammed together in one place. Then how could that one ounce of poison be evenly distributed among all the people? It couldn't. It couldn't be distributed among even a tiny fraction. Remember, botulinus toxin is an actual poison, not a germ that can reproduce its own kind and spread disease from one person to another.

There is still another reason not to get too excited about botulism. Besides the toxin, laboratory workers also have succeeded in making botulinous *toxoid.* The toxoid is a protective fluid used to make people immune, or resistant, to the poison.

When it comes to germs, we find that the true facts are much the same as for toxins. It is known for example, that a pair of tiny and "almost weightless" pneumonia germs injected into a mouse might kill the animal. From this, we might go on and say that, ounce for ounce and pound for pound, many germs have far, far greater killing power than botulinus toxin.

But in spite of the fact that germs multiply and are able to move around somewhat, they are not so great a threat as you might think. Any attacker would have a hard job getting the bugs distributed among large numbers of people. Many of those who were exposed to the germs would throw them off without harm. No single type of disease germs will make everyone sick. Also, we have many kinds of protective vaccines and toxoids which provide immunity against various diseases. And you know, of course, that we now have powerful new remedies such as sulfa drugs, penicillin, aureomycin, and other forms of medicine, which will cure many kinds of illness very quickly.

It is too much to hope that vaccinations and shots in the arm ever will give full protection from all the possible kinds of biological warfare. But at the same time, we can be reasonably sure that no enemy could attack us with some new disease germ or toxin that would bring quick illness or death to millions of people.

After we found out that a BW attack had been made, it might take time to find out what kind of germs or toxins were spread about. Even under a microscope, one kind of germ cannot always be told from another.

In such cases, it might be necessary to grow some of the sample germs in a laboratory. Then they could be injected into a mouse or a guinea pig in order to see what sort of illness developed. How long this would take would depend on the BW agent used. It might take a week, or even two.

Naming, or identifying, biological attacks is naturally a job for specially trained people. But even in this work you might be called upon to help out. For example, some types of trouble-makers like viruses cannot be seen even under a microscope. One way to find out if they were present would be for experts to study people's blood, or the bodies of animals.

If ever you are called on for a blood sample, don't hesitate to give it. Taking a drop or two of your blood won't hurt you, and it might help to identify the germs used in a raid. Prompt identification could save you and other members of your family from serious illness.

Farmers and ranchers might do their bit by donating a couple of chickens, or blood from their cattle, for labor-

atory examination if necessary. This could save them heavy losses in the long run.

KILL THE MYTHS

GERM WARFARE WILL KNOCK OUT ENTIRE CITIES

Germ warfare, or biological warfare as it is correctly called, is a special weapon for use against special targets. No kind of biological warfare could kill or sicken every person in a large area or city.

TALK OF POISONS THAT CAN KILL MILLIONS IS NONSENSE

Toxins, which are special kinds of poisons, can be deadly. But there are definite, practical limits to distributing them. Talk of one ounce killing millions of people is silly. You might as well talk of dividing one aspirin tablet evenly among the 11 million people in the greater New York area.

NO "MYSTERY GERMS" CAN CAUSE TERRIBLE EPIDEMICS

Epidemics are not likely to be caused by biological warfare. And even if one were caused, we probably could stamp it out quickly. The reason plagues used to sweep through whole populations is because our ancestors did not have the fine health safety systems we have today.

SIX SURVIVAL SECRETS FOR BIOLOGICAL WARFARE

Always Put First Things First

1. KEEP YOURSELF AND YOUR HOME CLEAN

Don't help germs by making things easy for them. Germs have trouble living in clean places, and people who keep clean are less likely to get sick.

2. REPORT SICKNESS PROMPTLY

If you or your family get sick, never fail to tell your doctor. If you live on a farm, report all sicknesses or deaths among your poultry or livestock. Report plant diseases or unusual insects you find in your garden or crops.

3. GIVE ALL POSSIBLE HELP TO AUTHORITIES

If you're asked for a blood sample, give it. If you're told a "shot in the arm" or vaccination is needed by all, don't hold back. Keep your neighborhood clean—starting now.

Never Lose Your Head

4. DON'T RUSH OUTSIDE RIGHT AFTER A BOMBING

Unless you have a civil defense job to do, stay inside until the all clear signal is given. Cover broken windows to keep out possible contamination.

5. DON'T TAKE CHANCES WITH FOOD AND WATER IN OPEN CONTAINERS

Bottled or canned foods would be safe after a BW attack, if the containers weren't broken. But foods in the open might be contaminated. If in doubt, boil for 10 minutes. That will kill most germs.

6. DON'T START RUMORS — DON'T BELIEVE WILD STORIES

Start a rumor and you may start a panic. A panic could cost your own life. So disregard wild talk about biological warfare and don't pass it on to your friends.

FOUR KEYS TO HOUSEHOLD SAFETY

1. KEEP THE HOUSE SPIC AND SPAN

Germs don't like clean houses. They do like warm, dark, dirty corners and heaped-up rubbish. So keep the house and yard clean. Keep garbage and refuse covered and get rid of it regularly.

2. AIR BEDDING, RUGS, AND CLOTHING

Sunlight and fresh air are among a germ's worst enemies. Airing blankets, mattresses, clothing, and rugs is healthy, even when there is no danger of biological attack.

3. KEEP THE FAMILY HEALTHY

Wash your hands properly before eating or drinking. See that the children do, too. That is just good, common sense. But be a little firmer than usual.

4. CLOSE UP THE HOUSE IN CASE OF ATTACK

Instructions given in "Survival Under Atomic Attack" hold here, too. A closed house would give some protection even against germ-filled aerosols or mists.

HOW CAN WE PROTECT OURSELVES FROM BW ATTACKS?

IF PREPARED WE CAN COUNTER BW RAIDS THAT MAY STRIKE US

HEALTH SERVICES FORM THE BACKBONE OF BW DEFENSE

TOO MANY PEOPLE ABSENT FROM WORK OR SCHOOL WOULD START A BW INVESTIGATION

Like defense against air attacks, defense against biological warfare is neither sure nor simple. In spite of all our defenses we might be hit. But if we are prepared—each person knows the facts and if we all work together—we can effectively defend ourselves against enemy BW raids that might strike us.

The health service divisions of our local civil defense organizations, working with our peacetime health safety systems, will form the backbone of our community defenses against biological warfare. Health officers, veterinarians, and plant specialists already are being instructed in biological warfare defense. Their job will be to spot the attack, pin it down, and stamp it out. Your job will be to help them.

Following enemy attacks, specially trained crews might be sent out to check for the presence of germs and toxins. To get the earliest possible warnings of undercover attacks, mechanical samplers might be used to find out if there were any unusual germs in the air.

Doctors and veterinarians may be requested to make special reports of unusual illnesses among people and animals in time of emergency. In the same way, workers' and school children's daily attendance records probably will be carefully watched. Large numbers of absences might be the first sign of a sneak attack.

WHAT CAN EACH PERSON DO TO HELP?

EVERYONE MUST HELP SPOT BW ATTACKS

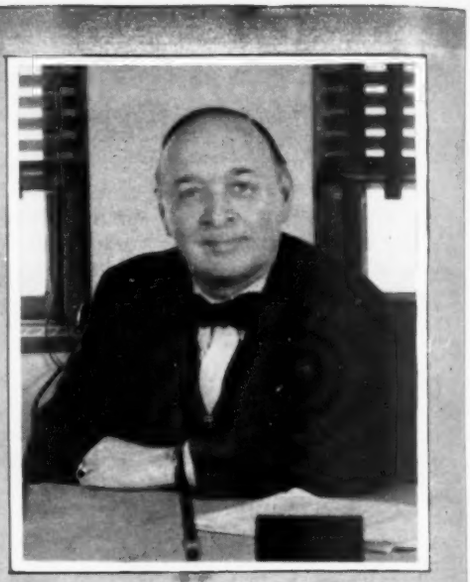
POSSIBLE SIGNS OF ATTACK MUST BE REPORTED PROMPTLY TO CIVIL DEFENSE AUTHORITIES

FARMERS SHOULD WATCH FOR UNUSUAL THINGS IN THEIR ANIMALS OR CROPS

It would be hard for the average person to see, feel, taste, or otherwise know about germs, toxins, or chemicals that might be spread about in a BW attack. Nevertheless, everyone must do what he can to help the health services detect a BW raid at the earliest possible mo-

(Continued on Page 52)

THE INDUSTRIAL MOBILIZATION COMMITTEE OF THE NEW YORK CHAPTER OF AFCA



Maj. Gen. William N. Porter, President, Chemical Construction Corp. (American Cyanamid); Chairman of the Committee on Industrial Mobilization of the New York Chapter.

National Headquarters agrees wholeheartedly with the plan as outlined by the Industrial Mobilization Committee and will do what it can to assist the Committee in its efforts.

W. E. LAWSON, President,
Armed Forces Chemical Association

Under the present organization of the Armed Forces Chemical Association, the Chapters must bear the brunt of its preparedness efforts. The New York Chapter may be regarded as a key unit in this program because of its strategic proximity to headquarters of industries located in New York where influential executives can be personally contacted. For this reason and because it has an unusually large reservoir of potential members, the New York Chapter must be expected to take the lead in carrying out the aims of the Association. If any Chapter of the Association is capable of making a worth-while contribution to national defense, the New York Chapter should be able to do so. Its membership of honorary life, life, group, regular, and student members totals 733 as of January 1, 1951. This large membership is a challenge to the Chapter, one unexcelled by that of any other Chapter.

When the Chapter President, Mr. Edwin C. Kenton, and other officers took office on the eighth of March, 1950, the national emergency was in sight. They surveyed the Chapter's problems and, realizing its possibilities and responsibilities in the national emergency, they were at once concerned at the little that had already been done. The officers found that an organization to carry out their objectives effectively did not exist. Steps were taken to establish bylaws to effect a realization of this goal. These were approved on the sixteenth of August, 1950 and provided for the appointment of five committees: Membership and Organization, Publicity and Program, Industrial Mobilization, Civilian Defense, and Reserve Officers Organization. Of these committees it is with the Industrial Mobilization Committee that we are concerned here. Major General William N. Porter, Chief of the Chemical Corps during World War II, President of the Chemical Construction Corporation, and Honorary Life Member of the Armed Forces Chemical Association, was appointed chairman.

While all activities carried out by a Chapter to accomplish the mission of the Association are important, the one to assist industrial preparedness for war is assuredly the most important. In carrying out this objective of his Committee, General Porter believes that its mission should include the following:

To work in close cooperation with the Armed Forces Procurement Agency in the New York area.

To bring the importance of industrial preparedness and all of its implications to the attention of the members of the New York Chapter.

To assist, as far as practicable, in the preparation of industrial mobilization plans by individual companies within the area.

To act as an agency of the New York Chapter, and through its officers advise the directors of the Armed Forces Chemical Association as to the preparedness situation and to make such recommendations to the National Headquarters of the Association as will enable it to lend assistance to Industry and the Department of Defense in solving problems which have become acute in the present national emergency.

To provide, when required, the services of competent subcommittees to investigate and report upon relevant subjects.

To encourage programs for adequate assistance by the Association in phases of the national defense with which it is concerned.

To act as an agency of the Chapter both to ask questions and to supply advice and information where needed.

General Porter believes that the members of his Committee should be men who hold positions of leadership in the various industries, who will take the objectives of the Association to heart, and who are in a position to recommend and designate qualified persons in industry who would voluntarily assist in any specific problem which might require solution. With this in mind he sought and obtained for membership on the Committee the following:

Mr. S. Willard Jacobs, Vice President, Niagara Alkali Corporation

Mr. W. R. Janney, Vice President, National Can Corporation

Dr. Ralph Evans, President, Evans Research and Development Corporation

Mr. E. W. Clark, Vice President, Allied Chemical and Dye Corporation

Mr. H. E. Wolfson, Vice President, World Steel Products Corporation.

Colonel Joseph F. Escude, the Chemical Corps Procurement Officer for the New York district who is thoroughly acquainted with the industrial personnel of the New York district has also been of great assistance to the Industrial Mobilization Committee through his purely unofficial and personal suggestions.

In accordance with his own views and after discussing them with the members of his Committee, General Porter reached the conclusion that the most satisfactory method of operation for his Committee should be as follows: After a discussion by the Committee of a problem submitted by industry or the Armed Forces, a subcommittee composed of men qualified by experience and training to suggest a practical solution to it would be recommended. These subcommittee members would represent a cross section of the better-known active companies connected with the problem being studied. They would act in an advisory capacity to the Industrial Mobilization Committee, and the results of their work, after consideration by the Committee, would be forwarded through the Chapter to the National Headquarters. From there it is presumed that it would be transmitted as an Association matter to the proper officer of the Department of Defense.

It soon developed, after this theory of operation was established, that the National Headquarters did not seem to be organized in such a way as to permit it to handle, for the Association, solutions which might be suggested or recommended by the New York Chapter. There seemed to be no theory of organization of National Headquarters which would provide the mechanism for studying these recommendations and, acting as a national body, for forwarding them to the proper office in the Department of Defense.

A discussion of this situation with the President of the Association resulted in Colonel Harry A. Kuhn, USA Retired, being appointed as liaison between National Headquarters and the Department of Defense or any office thereof. Colonel Kuhn is a past president of the Association and throughout its life has demonstrated a willingness to put his best efforts behind any project which was suggested.

While the appointment of Colonel Kuhn as liaison will be eminently satisfactory for the present on account of his experience with military procedure as an officer of the army and his knowledge of how to make suitable contacts in the Department of Defense, it is believed that this method is only an expedient and that consideration should be given to a possible reorganization or modification of the machinery at National Headquarters to provide the means for it to act satisfactorily as an Association in all details concerned with the Department of Defense. Much can be learned by studying the experience of the American Ordnance Association. This excellent organization might be a good model for anyone interested in the reorganization of the Chemical Corps Association's method of operation. The method of operation now being used by the New York Chapter to handle subjects of importance is satisfactory as far as it goes, but the results of its work would undoubtedly command more attention if its recommendations could be sponsored by a Committee of the national organization rather than from a local Chapter alone.

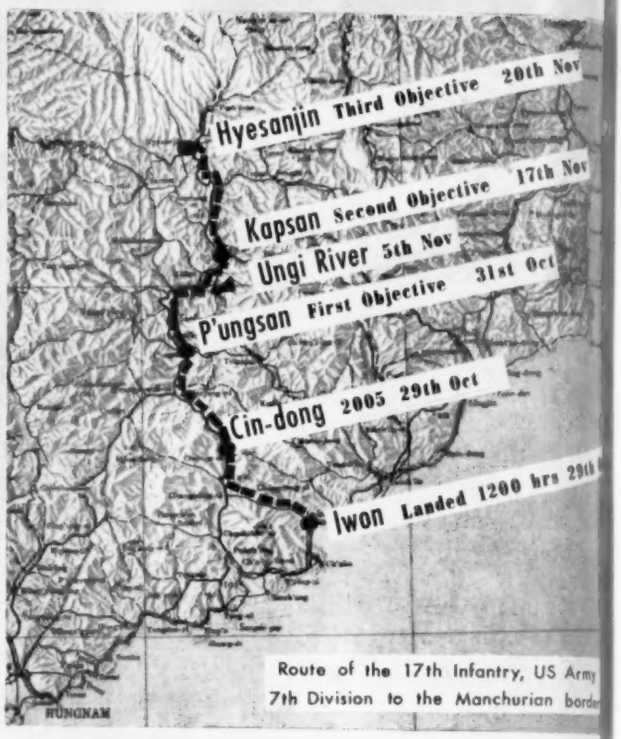
The method of operation of the Committee having been decided upon, investigation disclosed a procurement problem which involved the inability of industry to meet specification requirements and, interwoven with this, a shortage of industrial capacity. It was decided to use this problem as a test of the theory of operation since it involved both military and industrial aspects, the first being a matter for consideration by the Chemical Corps of the Army and the second being a matter for consideration by industry. Through the good offices of Mr. S. Willard Jacobs the following persons were appointed as a subcommittee with Mr. Jacobs as chairman:

Dr. G. P. Vincent, In Charge of Development and Research, Mathieson Chemical Corporation

Mr. William F. Mitchell, Vice President in Charge of Operations, Pennsylvania Salt Manufacturing Company.

Mr. J. A. Neubauer, Technical Director, Pittsburgh Plate Glass Company.

A meeting was then held in New York City to discuss the matter. The method of procedure was accepted by the subcommittee, and the members expressed their willingness to do what was necessary to reach a solution. This would include a visit to the Army Chemical Center for a conference with representatives of the Technical Command. A reference of the whole matter to General McAuliffe, Chief of the Army Chemical Corps, resulted in his complete agreement as to the suitability of the method of operation. He stated that he would recognize the subcommittee as an agency of the Armed Forces Chemical Association and would lend all assistance which appeared to be necessary; arrangements for a discussion of the problem with the Technical Command at the Chemical Center would be made by him. This is the situation at the present writing. The test of the method of operation indicates that the New York Chapter and the Industrial Mobilization Committee are working along the right lines, and effective, cooperative action can be taken on a National Defense Chemico-Industrial Problem which will be of material assistance to national defense. When the actual job has been completed, it is proposed to approach the Chemical Corps through the New York procurement district with a view to having other specific problems assigned to the New York Chapter and through it to the Industrial Mobilization Committee. Solutions of these problems would represent a really worth-while contribution both to industry and to national defense by the Armed Forces Chemical Association.


Hyesanjin Third Objective 20th Nov
Kapsan Second Objective 17th Nov
Ungi River 5th Nov
P'ungsan First Objective 31st Oct
Cin-dong 2005 29th Oct
Iwon Landed 1200 hrs 29th
HUNGNAM
Route of the 17th Infantry, US Army 7th Division to the Manchurian border

Flying Column

BY CAPTAIN RICHARD L. GRUENTHER

The 17th RCT was the only United Nations unit to reach the Manchurian border in the recent all-out offensive push. Here is the story of the Iwon to Hyesanjin drive, of this most traveled allied outfit, as seen through the eyes of a company commander. Captain Gruenther was wounded during this drive and was evacuated. Recently he was discharged from the Army's Walter Reed Hospital and returned to duty.

We've covered a lot of ground since September when we landed at Inchon with General Almond's X Corps. From Inchon to Pusan and now . . . God knows where. At least, I know we're on the east coast of Korea and we're heading North. My guess is that we'll make a landing above Wonsan because the Marines landed there last week.

As we move northward on LST's, my thoughts turn back not more than two months when I had my company assembled in Japan for one of those "frame of mind talks."

"Men, we've just finished another RCT exercise and as usual Charlie Company looked damn good. It was a tough problem, five days of hell we all thought, but that hell across the Sea of Japan is going to last a lot longer. Today, on this first day of September, I know the thought that's on every mind. When do we get started? Well, men, I don't know any more than you do, but the wind is blowing from the west and I smell a fight. The colonel has called a meeting at 2000 hours and I wouldn't be at all surprised if this is it. I've watched this company advance for two years and I know that we're now ready. With a company strength of 298, including our ROK's, we're as strong as many of the battalions in Korea today. As for fire power, there's not an outfit in Korea that can touch us. We're highly trained and physically fit and what's more important we've got a fighting spirit that's going to take us all the way to the Yalu River."

How little we knew then, and how much we've learned in our forty odd days of fighting! But, we still have a lot to learn. How little we know now of what's ahead. Will the war really be over when we reach the Yalu? I wonder.

"Gentlemen, we have just accomplished our Iwon landing without loss of personnel or equipment," said Lt. Colonel Francis Carberry, Commander of the 1st Battalion, 17th RCT. "This battalion has been selected again. This time we are to spearhead X Corps and not just the 7th Division. The general plan is that we cross the IP (initial point) on trucks at 1500 to secure the road north of Cho-ri. As long as we can take it, we will lead the advance. Our regimental objectives are Pungsan, Kapsan, Hyesanjin, Jo-Doko and Yongsan, in that order. Steve (Major George Stevens, III, the Battalion Executive acting as Corps Liaison) tells me that we are to be relieved and sent back to Japan after we reach the Yalu. The rumor is that the Third Division will occupy this arctic country, Heaven help them. I don't mind fighting here, but an occupation would drive me crazy. Oh, one more thing . . . Yongsan is, also, a Marine objective. I expect the 1st Battalion of the 17th RCT (Regimental Combat Team) to be there first. All company commanders and staff will report here at 1420 for the movement order. it is now 1358. Any questions? That is all, gentlemen."

Back on the beach, things were in a state of what the outsider might call confusion. To me it was just the routine movement of troops.

After giving the warning order to my platoon leaders and headquarters staff, things started to function. The order was sent out that all winter clothing would be worn and sleeping bags hand-carried. At that time, it was relatively warm on the coast, but air liaison had reported a blanket of snow high in the mountains and we were not going to get caught short.

Having planned for twenty-nine 2½-ton trucks to transport the battalion to its first objective, we were forced to change our plan when only nine were available. With thirty to thirty-five fully-equipped men on each truck, we managed to mount all of Company C except the cooks, supply personnel and the company clerk, who were to remain with the battalion train. A section of machine guns and two 81-millimeter mortars from D Company were mounted on their own organic vehicles which, along with the forward command post group, rounded out the advance element. The remainder of the battalion was to move up on the next shuttle or as soon as more transportation was available. As the two machine gun jeeps of the point moved across the IP, I checked my watch . . . 1500 on the dot. I felt strangely alone without the welcome roar of our friends from the 73rd Medium Tank Bn. Suddenly, I became aware of that familiar tingling in my stomach that always accompanies an operation of this sort. How many of us would ever see Hyesanjin and the border? How many men would stay here on this lonesome battleground? How would our small band fare this first night, deep in enemy-held territory? All these questions kept flashing through my mind as we began to swing north.

At 2005 our point, commanded by Lt. Phillip Kaplan, pulled over a high crest and radioed back that Oin-dong, our haven for the night, was in sight. Kaplan, then, moved out toward town with only the rays of an indifferent moon to light the trail. Almost without noise, the point jeeps moved through town and, after pulling off the road, set up heavy machine guns on either side to protect the advance of the main body. A 3.5-inch rocket launcher (bazooka) was skillfully placed on a high knoll overlooking the road. On signal the small task force pulled into town. I assigned a sector to each platoon and one by one they moved out to establish security around the town. As the platoon leaders moved their platoons out and the convoy moved back to pick up the rest of the battalion, I had the feeling that half the first day's battle was won. Suddenly, three shots rang out and, then, a blast that I knew to be a Russian burp gun. This commotion seemed to come from the second platoon sector. I called Lt. Harry Ware of California, platoon leader, 2nd platoon, on the 536 and asked, "What the hell's going on?"

He came back sharply, "Nowlin's fired on a squad of North Koreans. Got two, but I think they're dead. Others got away. Shall I pursue?"

"No. Tell Pvt. 'Deadeye' Nowlin to settle down. Every red man in the hills knows we're here now." I answered, "Bring the bodies here to me and we'll send them to battalion. Try to get one alive, but be careful with the fireworks."

With the exception of this small incident all was quiet in Oin-dong that night. I was fairly certain that no enemy was around or they surely would have struck. After a short one-hour rest, I was aroused from sleep in my foxhole by M/Sgt. Ralph J. Peterson of All-Japan football fame and the finest first sergeant ever to put on the diamond rockers. As he was alerting the company, I stumbled over to Battalion CP to receive the plan for the day's operation. The moon had gone down now and the pre-dawn hours were dark, damp and very cold.

As usual, the CP group had housed itself in the village schoolhouse. A warm fire was burning inside and a series of maps, 1/50,000 scale, were tacked neatly to the wall. A soot-black can of soluble coffee (that's what it said on the wrapper) sent out its good smell. I thought of the sarcastic words of my company exec, Lt. George Thoemke of North Dakota, as he talked of the "so and so damn Staff." But, I shrugged my shoulders and thought RHIP (rank has its privileges). I would enjoy what little my rank carried while I could.

Intelligence and Operations officers were making a map study of the area, and from them I learned that our empty convoy was ambushed on its return trip to Iwon. One truck had made it back here with no reliable information as to the fate of the others. It became obvious that we would not push off at dawn as planned.

By mid-afternoon the following day, 30 October, the approach of our leading elements of the second shuttle was announced by a phoned message from our post roadblock. We were greatly surprised to hear that they had received no fire in the pass whereas only three trucks had survived the ambush during the night.

Dawn on 31 October found us well on the way toward Pungsan with Able and Charlie Companies the lead units of the shuttle. We detrucked ten miles south of the town and proceeded cautiously on foot while the trucks returned to pick up the remainder of the marching battalion. As we approached the town at the base of a giant mountain, it became apparent that the honeymoon was over. Small arms fire echoed from the distant mass and as we filed across the long bridge entering town, we began to receive sporadic mortar and artillery fire. I agreed with the man who said it was an 82 mortar and, at least, two 76 mm. field pieces. Later, we learned that these were remnants of the Commie 23rd Coast Artillery Regiment. As I looked back, I saw a mortar round land in the middle of my third platoon as they crossed the bridge. Their pace quickened slightly, but none broke from the column in panic. Two men had been wounded, but the medic jeep would pick them up. The third platoon medic was with them now. They would be all right.

At the edge of town, half hidden in the shadow stood three grinning ROK's covering the bridge with a well camouflaged bazooka. Broad smiles echoed their pride in having beaten the GI's to their first objective. Pulling abreast I called out, "What outfit?"

They answered with conspicuous arrogance, "Capitol ROK." It was the Capitol Division, Republic of Korea.

By nightfall we had established a perimeter defense around Pungsan and had begun to tie in with the ROK troops on the hill. It was at 2330 that the enemy began an aggressive action that was to continue all night. The main effort in this attack was directed against the ROK sector. To me, it sounded as if the ROK Capitol was taking a kicking, but I knew the Old Man would move us in if that were the case, so I didn't worry. At 0300, my 2nd platoon outpost was overrun. All men except one were lost; however, an attack was not made in our sector.

The phone rang at 0505 on 1 November. It was the CP calling for all company commanders pronto. I told Lt. Thoemke to have the company ready to move on a moment's notice with a complete basic load of ammunition and without sleeping bags or parkas. After warning him to keep his radio operator alert for word from me, I left for the CP with my radio and my runner. When we reached the command post, all were waiting and we immediately set out for the ROK sector. The night was dark and brisk, but no air was stirring. For the first time, I became aware of the intense fire fight that was going on. The sound of numerous hand grenades told me that a fierce hand-to-hand battle was taking place. As we rounded the ridge and came into the open we were awed by the sight ahead. With the aid of my field glasses, I could see a battalion size force of North Koreans charging through the morning haze. I noticed that most of the ROK foxholes were empty or filled with lifeless bodies. It was then that I received one of those five-paragraph field orders which left no need for extraneous questions. Colonel Carberry turned slowly to me and said, "Gruenther, your baby." Knowing I need not bother to thank him for the privilege, I quickly radioed Thoemke to bring up the company on the double.

The Reds were being partially delayed by an A Company platoon, commanded by 1st Lt. Jack Carrig of New York City. This platoon was doing a magnificent job of holding the gap, but I knew it could not hold very long.

When the company arrived we did not stop to regroup, but maneuvered to the left and into the attack formation. My plan was to flank the enemy from the left by securing a razorback ridge running perpendicular to and just left of the enemy main effort. From this ridge, we would command the valley to both sides. As we pushed up the ridge, I glanced back and saw a sight which will live forever in my mind. Approximately one company of Commies with mortars had maneuvered to our flank and were staging an all-out attack on Battery B of the 49th Field Artillery Bn, which was supporting our battalion. In order to ward off the intruders, the 105 howitzers were forced to level off and fire point-blank into the attacking horde, which was less than 200 yards away. The result was devastating. As shells burst, I could see arms, legs and mortar tubes flying through the air. A five-minute shelling stopped the attack and left a mass of twisted bodies and just a few fleeing Reds.

Now, as we moved abreast of Carrig's platoon, it appeared that the bitter close-in fighting would soon halt our advance. I knew that the Red hordes could not cope with our superior fire power if we could only catch them in the open. Passing close to Carrig's position, I heard him shout something and point to a clump of trees as if to warn of some danger. This gesture was followed by a muffled "good luck." To satisfy my curiosity, I had my artillery forward observer call fire on the area in question. It came as no great surprise when this fire sent troops scurrying to the rear. This treacherous band had obviously planned to deliver flanking fire on our line.

"Add five zero, fire for effect," Lt. William Vargovick yelled to the artillery over his radio. For a man of limited experience, he was learning fast. Again and again, he plastered the fleeing Koreans. The destruction of this flanking effort demoralized the Commie main assault elements. It took us about twenty minutes to secure the commanding ground. The few fortunates who had escaped our fire could be seen darting through the fields below, but Vargovick was still working on them with the 105's.

I was giving instructions for the company reorganization when the battalion wire team arrived with a hot line from the Old Man.

"Boston Red Charlie," I answered. "This is hotshot. Yes, Sir . . . Yes, Sir . . . We'll do our best, Colonel . . . Thank you, Sir."

"Well, where do we go from here?" asked Sgt. Peterson.

"Up the tall one, Hill 1838 (elevation in meters), and hold there until we're relieved," I answered.

"And, what did you thank him for?"

"He wished us good luck."

A quick map study showed we still had 4,000 yards to go, not counting the 800-feet change in elevation. My chronometer read 1110. At best we would reach the crest after 1800. I had no love for night attacks, especially up steep mountains, and I found the thought of a perimeter defense at the mid-point even more depressing. Having seen the fury of a Korean attacking up a hill, I wanted none of them moving down on me.

To the right, I could see Able Company moving out toward its objective. This sight gave strength to my weary frame, but it quickly sapped as I glanced respectfully at the mountainous mass of misery ahead.

The battalion plan of attack was for Able and Charlie Companies to seize, organize and defend the commanding ground on either side of the pass. Once there, we were to protect the road until relieved by another unit. At that very instant, I would have been more than willing to forfeit the so-called honor of being the first to reach the border in return for just one can of that beer-a-day we had heard so much about. Just then, a message from the Colonel informed me that we were to hold up at the base and wait for an air strike. Our panel sets were no sooner in place when the first plane made a dry run on the target. Our tactical air control party was commanded by Captain Lundgren, who was not in sight but was undoubtedly with the Colonel across the pass. Those B-26's were putting 500 pounders all over hill 1838. We welcomed these fellows, today, not only for their killing power, but for their intelligence value. The North Korean has an unhealthy habit of returning the fire of attacking aircraft with his own individual weapon. In this operation, as in many others, this habit gave us information as to his location and strength.

I took advantage of the lull during the strike to call my platoon leaders together for an attack order. With this done, I wished them good luck and they returned to pass the word down through the chain of command.

U. S. Army Photo.

Reminiscent of the ETO in World War II, this doughboy, Northern Korea, dries his socks to prevent possible frostbite.

My plan was to attempt a double envelopment. The first platoon with its attached mortar and 57 would move to the left and attempt to approach the hill from the rear while the remainder of the company would move up the east side. I felt certain that the right element would meet with stiff resistance, but I hoped that the 1st platoon would be able to flank the enemy and secure the objective. No coordination was necessary with Able Company because their objective was almost 2,500 yards to our right.

It was 1530 hours when the B-26's gave us one for the road and pointed their noses toward Japan. The flight leader dipped his wings as if to say good luck and happy hunting to his brother on the ground.

Without waiting for orders from battalion, we were on the way to the objective. Half way up the treacherous mountain and still no enemy. Lt. Kaplan with the 1st platoon reported some opposition, but said he was going to skirt around them. He must have been almost a mile away because radio reception was growing weak. Here on the shady side of the hill, tension was mounting. Could those devils have pulled back without a fight or did the

air strike neutralize them? Not a man had a breath with which to talk, but heavy thoughts were on each mind.

Looking up the mountain trail before me, I saw that we were coming to the steepest part of the hill. I would defend there if I were the enemy, I thought, and so radioed Lt. Charles Rammel of Alexandria, Virginia, to set up the mortars.

No sooner had I given this order, then all hell broke loose. I saw a spray of machine gun bullets hit the ground beside me. Judging from the crack of the bullets overhead the enemy was not far away. The Reds had sucked us in. The second platoon ahead had been forced to take cover. Some men had moved too slowly and lay squirming on the ground. One man to my rear cursed oaths of wild hatred as the blood from his legs made a red clay out of the dusty earth. The lifeless body of a 2nd platoon ROK was stopped by a GI boot as it rolled loosely down the mountain. Then our mortars laid in their first round. The fight had started.

There aren't enough words to describe the ingenuity and resourcefulness of my fighting doughboys. Giving more credit to them than to my application of tactics, we took the hill in a bloody four-hour battle. Once the high ground was secured, we were assured ultimate victory in the pass.

U. S. Army Photo.

Elements of the 2nd Battalion, 17th Infantry Regiment, 7th Division, arrive in the town of Pungsan, Korea.

In the four days of fighting that ensued, the 17th Infantry cleared the pass and made a serious dent in the North Korean defense. The 71st North Korean Regiment was almost completely annihilated in that action. This was not done, however, without the loss of many gallant U. S. Infantrymen and not without many outstanding acts of heroism, most of which will never be recorded in history.

On 5 November, we cleared the last road block between Pungsan and the Ungi River. A seven-mile foot march took us down the twisting mountain road to the banks of the Ungi which was to be our pasture land for the next nine days.

As was often the case, Maj. General Edward M. Almond, CG, X Corps and Maj. General David G. Barr, CG, 7th Division, marched with the forward foot elements of the first battalion as it continued to lead the X Corps to the border. Having planned to drive to the Yalu without a halt, the troops were somewhat discouraged when they learned that higher headquarters was going to hold up the 17th south of the Ungigang. Had we been permitted to push ahead 5 November, it is my opinion that we could have been in Hyesanjin by 10 November without serious loss of personnel or equipment. Of course, this would have left the regiment in a vulnerable position for it would have been impossible to keep the road open at that time.

It was about midday on 13 November that we received our warning order for the coming offensive. The situation map showed this to be the big push, to end only when we hit the Manchurian border. Lt. Milt Uffman, 1st Bn. S-2, gave us the latest on the enemy situation. Higher headquarters had reported 40,000 Chinese troops near the 1st Cavalry Division's sector. The same report stated that a meeting engagement had left some 500 1st Cavalry troops unaccounted for. Just a rumor, we thought.

In our area a few Red Chinese had been spotted, but none had indicated any desire to fight. The 300 to 500 North Korean survivors of our massacre in the pass had limped back through Kapsan, according to our Intelligence agents. Eight days of stalemate, however, allowed three freshly equipped regiments to honeycomb the hills to our front. Both civilian reports and friendly patrols indicated heaviest resistance to be between here and Kapsan. For the past seven days our patrols have had to fight their way back once they left our perimeter. Some had even been attacked as close as 800 yards to our flank.

With the S-2 information digested, Col. Carberry gave us the rest of the order to include plan of attack, methods of control, and administrative detail. The big picture seemed to indicate an all-out 8th Army and X Corps offensive. Word was circulating that we would be relieved when we hit the Yalu. On the local scene the 17th Infantry would cross the Ungigang at dawn.

Under cover of darkness, the men of the 13th Eng. Bn., under Lt. Stark and our 1st Bn. pioneer platoon under Lt. Gerald LaBounta of St. Paul, Minnesota, waded in waist deep icy water, to construct a crossing for foot troops. It was the courageous work of these men in the sub-zero weather which enabled the 1st and 2nd battalions to accomplish their mission. The 3rd Bn. of the 17th was unable to find a suitable bridge site in their zone just 4000 yards downstream. After several attempts to wade the frigid current under fire, they were forced to withdraw and cross behind the other battalions. With maximum use of all supporting weapons, we succeeded in securing the hills in two days of bitter fighting. During this two-day period, a fanatic enemy launched many suicide attacks in its attempt to dislodge us. Each time, we managed to smooth them with a generous application of lead. 16 November saw Company B, commanded by Lt. Earl Meredith, pushing out in tanks toward Kapsan. The 1st Bn. still held the lead.

It was on 17 November that our flying column, as it had come to be known, broke through a stiff road block and started a rapid push that lined the road with North Korean dead all the way to Hyesanjin. The addition of our regimental tanks and the self-propelled weapons of the 15th Antiaircraft Artillery Company contributed substantially to the killing power of our advance. I think I will always remember the words of Lt. Col. Carberry as he watched his tank-led column push those last few miles, "It does my soldier's heart good to see so many dead Communists and to know the part we are doing to make the world safe for freedom-loving people."

For me to attempt to give a first-hand account of the push past Kapsan would be a misrepresentation. It was during the destruction of the roadblock that a North Korean missile found its mark in my chest and caused my evacuation as a casualty. I am indebted to my friends in the 17th Infantry who sent me the details with which to complete my story.

The advance gained momentum from Kapsan to the border. We were strengthened by the added fire power of five tanks and two platoons from the 15th AAA. Their guns were kept hot as they left a path of blood beside that treacherous mountain road.

Fired by the fruits of victory and a fighting Infantry spirit, the 17th pushed on to the border. At one time Maj. John T. McNight, regimental operations officer, made a frantic effort to stop our progress, for fear we would become over-extended, but only the sight of Hyesanjin could stop the advance.

On 20 November, led by Company C, the 17th RCT pushed proudly through the city of Hyesanjin to be the first and only United Nations unit to reach the Yalu River border. But, even as the triumphant entry was being made, it became apparent that the character of this War had changed. We had a new enemy and there were new problems that called for new calculations. The Chinese Communist armies were in and we couldn't so much as throw a rock at their marshalling areas or supply lines across the muddy river that marked the Korea-Manchuria border.

It was approximately seven days later that the 17th RCT withdrew unnoticed and shielded by a security blackout to that famous Hungnam beachhead, over 200 miles away. By a combination motor shuttle, foot march, and rail movement the beachhead was reached with negligible loss to personnel and equipment. Security measures still forbid further mention of this achievement other than to say that Colonel Herbert B. Powell deserves much of the credit for his regiment's success.

Perhaps, at this point, it would be to advantage to stop and discuss several characteristics of the North Korean and his method of waging war. These principles will apply not only to the North Korean, but also to the Chinese. First, let us look at his offensive tactics. Before launching his attack, the Red Commander will invariably send a small but effective force to the flanks and rear of our position. This is done with the idea of cutting our supply lines and routes of withdrawal. The enemy obviously believes that we cannot fight with this vital area blocked.

The next move is to send out lightly armed reconnaissance parties to probe our lines and feel out our gun positions. Many of these fearles night reconnaissance bands have been spotted as far back as our regimental headquarters. It is worthy of note that Red troops are always careful to avoid roads and flat terrain during daylight hours when they are subject to the vicious attacks of our tanks and air force. After learning as much as he can of our defensive set-up, the enemy will attack our weak points. His attack formation will have a broad front and considerable depth. The shock troops of this force will have many automatic weapons and hand grenades. We have often found as many as 10 grenades on one dead North Korean soldier. It is not uncommon for them to launch simultaneous attacks on three fronts. More often than not, the attack will take place during the hours of darkness. My experience has been that a good tight all-round defense is the most effective means of resisting this type of opposition. Of course, difficult terrain often renders this impossible.

On the defensive, the Red is at a great disadvantage. Prisoner-of-war interrogation has revealed his great respect for U. N. supporting weapons. His prepared offensive positions are always well camouflaged and usually run along a mountain corridor with a highway at the base. Dummy positions are frequently dug in a conspicuous area to draw our fire. We have also noticed that dry grass and dead wood is cleared from these emplacements to prevent fire from incendiary bombs. When defense in depth is employed, distribution of men in the front lines is small, but the ratio of automatic weapons is greatly increased. Almost without fail, the enemy will attempt to ambush our advancing elements. He will allow us to move up to within 75 yards of his position and then open fire with one tremendous volley. The principle of interlocking bands of automatic fire is employed with good results by the North Korean.

All things considered, the Red soldier has proved to be a mean enemy. His complete disregard for death makes him irrational and many times unpredictable. Therefore, he is not to be treated as insignificant, but must be studied and observed with great caution.

It is my opinion that our tactics and strategy used in Korea, generally speaking, are superior. True, we have suffered some setbacks, but these have been brought about by the enemy's superior strength in numbers. We must also consider that each time an American soldier dies he takes ten to twenty Communists with him. This ratio increased, of course, as the United Nations forces moved farther to the south.

Self-propelled 155 mm. howitzers of the 92nd Field Artillery fire a support mission for elements of the U. S. Army 7th Division.
U. S. Army Photo.

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The U. S. Air Force Today

Any discussion of the United States Air Force today may well begin with an account of Air Force operations in Korea. What we have done there, and what we are prepared to do, if necessary, reveal such a state of efficiency on the part of the Air Force, that the American people can face an uncertain future with full confidence in the readiness of the Air Force.

Outstanding fact about Air Force participation in the Korean conflict is that Air Force support of ground operations in Korea has been eminently satisfactory. United Nations troops have been given more uninterrupted assistance by fighter planes than any army in history. The Air Force's use of tactical air power, including jets previously untested in battle, has been completely vindicated by the results achieved. An Air Force, which had as its primary role the defense of the Japanese islands against possible seaborne or airborne attack was supporting South Korean troops two days after the fighting erupted, and before soldiers or marines were committed to action.

It is true that tactical air support was inadequate during the early days of the fighting in Korea, but so were soldiers, marines, tanks and guns. On June 25, 1950, the United States Air Force had forty-eight groups of the 70 air groups needed for the minimum calculated risk, and the Army and Navy had been cut proportionately from minimum required strength.

The damage from the air to the North Koreans was not immediately apparent in the early stages of the war, of course, though later events have proved the effectiveness of it. *Events have also proved, once and for all, that tactical air power is a supplement to, rather than a substitute for, ground strength.*

United Nations policy prevented air strikes at the Manchurian troop and supply depots supporting the Chinese. Isolating the battlefield from reinforcement is the prime function of tactical air, and that function was accomplished. But strategic air has not been permitted to operate fully—and thus holds no place in a discussion of the Korean conflict.

Last November, we lost a battle in Korea, but air power kept us from losing a war. The Chinese, denied the use of roads during the day by UN air patrols, could not follow our forces fast enough to turn an orderly withdrawal into a rout. Everything from blood plasma to portable bridges were dropped to isolated units, saving them from annihilation. And when an evacuation beachhead was established at Hungnam, command of the air prevented the Chinese from bringing up the heavy artillery that could have riddled our troops at close range while they were jammed into the staging area waiting to board ships.

Critics who disparaged the Air Force's performance earlier in Korea failed to understand or consider the difference between close support—attacks in their immediate battle sectors—and genuine tactical air power—attacks behind the lines to isolate the battlefield. Commanders whose responsibilities embraced a wider area had nothing but commendation for the Air Force. The late Lt. Gen. Walton Walker of the 8th Army even announced officially that the air's claims of destroyed enemy materiel were too low—a strange reversal of the World War II criticism that claims of air damage were consistently too high!

The job of tactical aviation is to help win the air war and to weaken the ability of the enemy's ground forces to impede and damage our own people.

Trying to evaluate the lessons of air power in Korea in the utter absence of enemy opposition is a waste of time.

The piston planes that hovered over the battlefield would have been forced to high-tail for home by one enemy jet. The Air Force's tactical arm is being converted to jet propulsion as rapidly as possible, on assumption that it it must be prepared to fight a major war for control of the air which will be fought with jets. That vital battle can be won only with jets—and our most probable enemy has them in great numbers.

Jets are superior to piston planes for every conceivable job demanded of a fighter plane, including flying at treetop level to silence one machine gun. A jet pilot's view of the target is clearer; the jet is a more stable gun platform because its cleaner configuration reduces vibration and torque. The tremendous speed of a jet has given rise to the fallacy that it is too fast to hit a target on the nose. If necessary, a jet can be slowed down to within ten miles an hour of the speed of a piston plane, but even at 500 miles per hour it is a more precise weapon than a piston plane doing 250 miles per hour.

The jet, previously untried in combat, confounded the experts with its toughness in Korea. As of November 9, the F-80 jet had flown 16,141 sorties against 12,188 sorties by the F-51 piston. Enemy ground fire brought down twenty-one F-80s and fifty F-51s. The jet is easier to maintain in the field because it is a less complicated machine. The jet is twice as fast and can respond, therefore, more quickly to an emergency call from the ground. The piston plane's range is greater, but it must be remembered that the piston engine is in the final stage of development, whereas the jet is in its infancy. Jet pilots require more training, but they'll live and fight longer. Summing up, the jet is an all-purpose plane that can do everything better than a piston, including close support. Above all, it has the first "must"—the ability to help win the airbattle.

Air battles of another war will be very different from air battles of World War II, however, and largely because of technical improvements in aircraft. Modern aircraft travel at altitudes and at speeds unknown to pilots of the last war.

Jets must, therefore, be used for interception because they alone have the speed to overtake an attacker and, equally important, the ability to gain altitude quickly. With approaching bombers flying 100 miles in slightly more than 15 minutes, a conventional piston plane is useless for defense work. It takes three times as long to climb from the ground to 40,000 feet as a jet—and the last half of the climb is twice as long as the first for both types of planes. Downing a plane flying seven miles or more above the earth with anti-aircraft fire is extremely difficult, and with the increased speed of jet planes, ground fire becomes less effective. We must still rely principally on men going up in other jets to meet the enemy in direct contact.

When we progress from discussion of the specific to the general, we find that our experiences in Korea have been as instructive concerning air superiority as concerning tactical air warfare. Air superiority alone cannot win a war, but loss of air superiority can lose it. The Soviet Union has probably 450 planes that can strike at major centers of population and industry in the United States from bases in the U. S. S. R. If war with the Soviet Union should come, we can be expected to destroy not more than 30 percent of the planes making an attack in strength on the United States before their bombing missions are completed. To save ourselves from defeat in an offensive action directed at us, we must be able to launch a strong offense for immediate retaliation. Offense, not defense, insures air superiority.

A somber analysis of air power will help us to project its potentialities and limitations into the future. First of

Unloading a tank from a Douglas C-124

Radar plays a highly important part in the la... methods of defense of vital United States coast... and industrial areas. Sets such as the AN/C... (large structure in center), and the AN/CPS-... (smaller orange peel-like sets) form comp... installations for protection against enemy air at... The CPS-10-A "orange peel" sets rock verti...

all, we must realize that the role of the air in the defense program is not determined by the United States Air Force alone. Broad policy decisions are made by the Joint Chiefs of Staff—and this planning board, composed of the chiefs of the Army, Navy and Air Force, and with a Chairman of their own (currently Gen. Omar N. Bradley, formerly Army Chief of Staff) has given the Air Force three jobs to perform—strategic bombing, air defense of the United States, and tactical support of surface forces.

Although these three jobs seem pegged to different objectives, air power is indivisible. The functions of so-called strategic and tactical air overlap and supplement each other.

The fundamental purpose of air power, whatever the type of plane employed to exercise it, is to win the air battle on which final victory on land or sea is predicated. Strategic air power destroys the source of an enemy's war-making potential, and his industrial capacity for waging war, but tactical air power also attacks strategic targets, thereby relieving the pressure on the big bombers and the units assigned to continental defense. At St. Lo, in July, 1944, the greatest concentration of heavy bombers ever seen was assembled to give direct *tactical* support to ground troops for the break through the German lines. In October, 1944, big bombers operated from Clark Field, near Manila, against Japanese troops less than ten miles away. In August, 1950, B-29s dropped 1,000 tons of bombs on the positions of 40,000 North Koreans massed along the Naktong River threatening to shatter our precarious lines in the Waegwan area.

In the Atomic Age, more than ever before, a strong offense is the best defense. The U. S. Air Force is not deceiving either itself or the American people into believing that any nation would hesitate to attack us because it would lose probably 30 percent of its planes in the attack. The awful destruction of one atomic bomb dropped on an American industrial center would compensate the Red aggressors a thousandfold for the loss of 30, or even 100 planes and crews. But Communist aggressors might well hesitate to attack us if they knew—and they do know—that we can retaliate swiftly and bring more destruction to them than they can inflict on us.

Backbone of our strategic air arm which would deliver an atomic bomb is the B-36, which has more speed, range, armament, and carries a heavier bomb load than any big plane in operation today, or any plane the Soviets can get into mass production in the next few years. The B-36 can fly faster than 400 miles an hour and has a combat radius of more than 4,000 miles. Its great range makes it possible to fly 4,000 miles to perform a bombing mission, then return to home base, with fuel left over.

Combat radius is the key to the advantage we hold in the air. Every industrial and communication center in the U. S. S. R. is well within the combat radius of the B-36, while the TU-4, the best bomber the Soviets have yet produced, has a combat radius of only half as much. The Soviet's TU-4 could just about reach America's nerve center on a one-way suicide mission, while every American plane that returned would fly and bomb again.

The B-36 does not represent the limit of our invention. The B-47 and the B-50 are other conventional bombers that can perform similar missions from overseas bases or, with refueling techniques, from this continent. Moreover, we have almost ready for test flights an intercontinental jet bomber. The increasing power of our strategic bombers cancels out the numerical superiority of the Soviet Air Force.

Although strategic air power is essentially an offensive weapon, it is actually our first line of defense. The most effective method of knocking out the enemys air, and keeping it knocked out, is to destroy the means that keep it alive. If war should come, the United States Air Force, would attack simultaneously two targets—the industries feeding the enemy's war economy and the enemy air force itself.

Radar screens to detect approaching enemy aircraft and complicated electronic devices will not give us an airtight defense against bombing, but they will help to prevent some enemy bombers from dropping atomic bombs on American cities. Our radar network needs strengthening,

...sting electronic beams that detect the altitudes ... nearby planes flying at low altitudes. The larger ..., the CPS-t, ferrets out aircraft at distances up ... 200 miles . . . in addition, it determines the ...titude, distance, speed and direction of such ...planes.

Airman On Front Lines With Cavalry

The Epics of Rescue—A helicopter from an Air Rescue Squadron, lands at the Korean front to pick up a wounded G.I. Moments later the wounded G.I. was loaded into the litter beside the "Chopper," and flown to a hospital located in the rear.

but so does every other aspect of the military establishment. Total victory in modern war is the product of ground, sea and air power. Our ground forces in western Europe must be strong enough to stop the enemy from capturing the industries of Western European countries, and the Navy must be strong enough to fight off the Soviet Union's large fleet of snorkel submarines and keep the supply life line to Europe open, while our strategic air power is destroying the enemy's capacity to make war and our air defense is defending the United States.

It is a physical impossibility to build an adequate Army, Navy or Air Force if disproportionate manpower and materiel are diverted to continental defenses. We cannot build either an air force or a radar screen to guarantee immunity from air attack, but we can build an air defense that is the best any civilian population ever has had.

The most direct route for an attack by the Soviet Union on the U. S. is from the north over land radar stations, by way of the Arctic Regions. Therefore, at all hours of the day or night, pilots in critical areas are sitting in planes ready to respond instantly to an alert. But this is not enough. We must continue to decentralize American industry; we must put meat and muscle on our whole military establishment; and above all we must rid ourselves of any trace of complacency.

Air power alone does not guarantee America's security but it best exploits our technological skill. We cannot hope to match the Communists in manpower, but we can, as in the last war, produce more and better planes than the rest of the world combined, and train young Americans who already have the mechanical facility for flying all the planes we build.

There is no such thing as a cheap or a safe war, but it is many times cheaper to win a war than to lose it. Victory in the air is a long, laborious struggle. But air power holds the hope of peace. How long the fear of retaliation of strategic bombing will restrain the Russians from plunging the world into chaos is something only the masters of the Kremlin know. But every day the crisis is postponed by diplomacy gives us one more day in which to strengthen the American strategic air power that may at least preserve an armed truce.

PINE BLUFF ARSENAL

and Mid-West Chemical Depot . . .

Pine Bluff Arsenal is one of three Chemical Corps arsenals. Midwest Chemical Depot is located within the fenced boundary of Pine Bluff Arsenal. The two activities are served by the same utility system and have the same commanding officer. The reservation is located in the southeastern portion of Arkansas and is well situated geographically. The climate is favorable for manufacturing, transportation is adequate and there is a plentiful supply of electricity and natural gas at favorable rates. The labor supply is drawn from a radius of thirty (30) miles of the arsenal. This area has proven to be sufficient to supply the needs of the arsenal.

Prior to the construction of Pine Bluff Arsenal there was little industrial activity in this portion of the state. The city of Pine Bluff was a division point for the St. Louis Southwestern Railway Company and the company's principal repair shops were located there. This was the largest and only important industrial plant in the city. Little Rock, Arkansas is 43 miles northwest of Pine Bluff and this city of 100,000 population had only a comparatively small amount of industrial activity in 1941.

The labor within this area is essentially agriculture and has proven its adaptability to training and development into semi-skilled and skilled personnel. Many of the skilled mechanics used on the arsenal production lines during the war years were developed from the immediate area. Because the normal vocation of the labor is agriculture, there is a strong tendency for it to be non-transient in character.

It can now be seen that the site selection was a fortunate one but in 1941 there were serious doubts about the adaptability of local labor and it was only because of a preponderance of other favorable factors that the decision was made. After a tentative location had been selected, emphasis was placed on speedy construction.

On 13 November, 1941 a contract was entered into between the government and Sanderson and Porter of New York for the construction of an arsenal and depot in the vicinity of Pine Bluff, Arkansas. This contract was the "go-ahead" signal to the architect-engineer to begin construction and construction equipment started moving toward a point approximately 10 miles northwest of the city of Pine Bluff. This location had been selected as the site of the new arsenal and depot and no time was lost in getting started.

The arsenal was officially activated 21 November 1941 and temporary headquarters were established in rented offices in the city of Pine Bluff with Colonel A. M. Prentiss as commanding officer. On 2 December, 1941 ground was officially broken and Pine Bluff Arsenal was under construction. On 5 March, 1942 the arsenal was officially designated "Pine Bluff Arsenal" in the War Department general orders. By 1 April, 1942 construction work had progressed to the point where the headquarters building was ready for occupancy and headquarters personnel moved from rented quarters in Pine Bluff to the arsenal site. The contractor made excellent progress and on 20 July, 1942 the first munitions were produced at the new arsenal. As the contractor completed a plant, it was turned over to the arsenal and production started. In early March, 1943 the Napalm plant was completed and on 16 March, 1943 production of napalm was started. This was the last unit and Pine Bluff Arsenal was essentially com-

LT. COLONEL HARRISON S. MARKHAM
Commanding Officer, Pine Bluff Arsenal

From left to right: Major T. W. Rogers, Executive Officer; Lt. Col. A. H. Williams, Comptroller; Lt. Col. H. S. Markham, Commanding Officer; Major C. A. Morgan, Jr., Arsenal Operations Officer; Major E. A. Limbaugh, Chief, Midwest Chemical Depot.

plete. Facilities had been provided for filling magnesium incendiary bombs and thermate-filled grenades, filling white phosphorous shells, bombs and grenades, HC smoke filling, manufacture of chlorine, manufacture and filling of H and the manufacture and filling of lewsite.

The buildings comprising Pine Bluff Arsenal and Midwest Chemical Depot are divided in four main areas. The chemical (North) area (Area 5) contains buildings primarily for the manufacture of toxic gas; the Midwest Chemical Depot Area (Area 6) is made up of buildings, igloos and storage areas for the storage of munitions and gases; the central area (Area 1) has buildings for administration, housing, hospital, troops and post facilities; the south area (Area 3) is divided in six sections and buildings are adapted to the needs for manufacturing and filling incendiary and miscellaneous munitions.

Due to the large scale operations and self-sustaining features of the arsenal and depot, the buildings are of many different types ranging from small frame sheds to a concrete and tile structure with 110,000 square feet of floor area. Mostly the buildings devoted to manufacturing are of concrete and hollow tile and were constructed for the particular munitions involved. The main administration building and military housing are frame construction and the depot igloos are reinforced concrete. Some corrugated asbestos was used for buildings in the chemical area and for 12 warehouses in the south area. There are approximately 1,300 structures within the arsenal boundary fences with a total usable floor space of 3,685,000 square feet.

As might be expected from a plant the size of Pine Bluff Arsenal and Midwest Chemical Depot, the utility system is quite a large one. A standard gauge railroad serves the manufacturing areas, depot and warehouses. The trackage connects with the St. Louis Southwestern Railway Company and the Missouri Pacific Railway Company. Both railroads have excellent connections to all parts of the United States. There are 45 miles of government-owned railroad track on the reservation. Motive power is diesel electric and they operate over maximum curvature of 8 degrees and maximum grades of 1 percent.

The road system is connected to U. S. Highway No. 65 and U. S. Highway No. 79. There are 1,880,000 square yards of roads and parking areas of all types on the reservation. Converted to an equivalent 22′ width, this amounts to 146 miles of roads. The principal surfacing is asphalt. The roads connect all areas and facilities with an all-weather road system.

Process steam is produced in five separate boiler plants. One plant with a capacity of 100,000 pounds steam per hour is located in the chemical area. The other four plants are located in the south areas and are all interconnected with a steam tie line. The combined capacity of south area steam plants is 127,500 pounds steam per hour. All steam plants are gas fired with oil standby in case gas service is interrupted. Compressed air for manufacturing lines is furnished from 10-500 CFM electrically driven air compressors located in the south area steam plants. The air lines, like the steam lines, are interconnected to operate as one unit. During full scale operations the steam capacity was 95 percent utilized.

Water for the arsenal requirements is pumped from wells on the reservation. There are seven deep wells (1,000′) and three shallow wells (100′). The wells have a capacity of 10,000,000 gallons per day. The entire capacity of the wells was used at times when production was at a peak.

rior view of Fill and Press Building—Incendiary Filling Area—Pine Bluff Arsenal.

View showing area housing 343d Cml. Service Co.

Natural gas is used for heating and making process steam. The gas is purchased from the Arkansas-Louisiana Gas Company. Approximately 6½ million cubic feet were consumed on peak days.

Electricity is purchased from the Arkansas Power and Light Company. The power company serves the arsenal with 1 110 KV line and 2 13.2 KV lines. Peak monthly consumption was 7,132,000 KWH, August, 1944.

Maximum employment at the arsenal and depot was reached 1 December, 1943. At this time there were 8,969 employees. After 1 December, 1943 operation of the various plants varied with some operations curtailed due to decreased requirements for certain munitions. Filling of the magnesium bomb and various white phosphorous-filled shells, grenades and bombs together with the operation of the chlorine plant constituted the bulk of the arsenal production. HC smoke lines, manufacture and filling of mustard and lewsite shells and bombs and napalm filling were other production activities carried on as the need for these munitions occurred. All schedules assigned to Pine Bluff Arsenal during World War II were met on time. The arsenal was awarded an E flag early in the war and earned the right to retain this emblem of "Excellency" throughout

A typical igloo—Midwest Chemical Depot

the war. On VJ Day contractor was engaged in constructing facilities for filling 4.2 shells for the recoilless chemical mortar and the project was about 40 percent complete. This project was discontinued with the end of the war and Pine Bluff Arsenal became an "inactive" installation with the depot remaining "active."

In line with Department of the Army peacetime policy, buildings on the arsenal were offered for lease and in December, 1946 arrangements were completed for leasing the chlorine plant and lewsite manufacturing buildings. These facilities were leased to Diamond Alkali Company, of Cleveland, Ohio. This company retained the chlorine plant for the manufacture of chlorine and caustic soda, and subleased the lewsite buildings to Michigan Chemical Company, of St. Louis, Michigan, for the manufacture of DDT. Later Michigan Chemical Company transferred their holdings to Food Machinery Corporation, and this company is now operating the plant under the name of Pine Bluff Chemical Company. Lessee started operations in April, 1947. Later white phosphorous empty and filled storage rooms were leased to Hammond Bag and Paper Company, of Wellsburg, West Virginia, for the manufacture of multiwall paper bags; and approximately two-thirds of the "H" filling plant was leased to the Larkin Electro Products Corporation, of New York City for the manufacture of transformers. All the leases are still in effect and total rentals amount to $293,212.00 per annum.

Pine Bluff Arsenal remained in an "inactive" status until 1 July, 1949 when it was declared an "active" installation and planning was started for filling magnesium bomb bodies with thermate. Renovation of munitions represented the major activity at the arsenal prior to the outbreak of hostilities in Korea, however, a thermate filling line was opened up in March, 1950 and magnesium bomb bodies were filled at Pine Bluff Arsenal after a lapse of four and one-half years. After the outbreak of hostilities in Korea three additional thermate filling lines were removed from standby and made ready for immediate use. The present production of magnesium incendiary bombs is based on using reclaimed bomb bodies. These bomb bodies are from Class D clusters that have been stored at the arsenal since the end of World War II. The tails and firing mechanism are removed mechanically and the thermate filling is drilled and washed out, leaving the magnesium body in condition to receive new filling.

From the beginning of Korean hostilities planning was accelerated on getting smoke lines in production and on the installation of grenade filling facilities. The smoke equipment had been removed during World War II and shipped to Huntsville Arsenal. This equipment was returned to Pine Bluff Arsenal when Huntsville Arsenal was declared surplus and is now being installed at this arsenal. Grenade filling facilities include plants for mixing and filling white and colored smoke, thermate and CN. Colored smoke and CN are new items to Pine Bluff Arsenal as these were not mixed and filled at the arsenal during World War II.

An increase in arsenal personnel started in August, 1950 and has continued to increase as additional facilities are added. Between August, 1950 and January, 1951, there was a 60% increase in personnel and this percentage is still increasing. The all-time peak of arsenal employment was reached in December, 1943 when 8,960 civilians were employed. In July, 1947 there were only 672 employees and this represented the low-point arsenal employment. It has been noted that during the present expansion of personnel, there is a large percentage of former employees returning to jobs where they were previously trained. This assures the arsenal of a nucleus of trained people for the expanded programs and will naturally lessen the time required to reach maximum capacity. The adaptability of local labor has been a source of satisfaction since the first days of the arsenal. Agriculture and domestic workers became proficient at the production lines after a short training period and compiled a production record comparable to what would be expected from labor recruited from an industrial area. The local labor recruited largely from cotton plantations and saw mill operations supplemented with female labor from the Pine Bluff area earned the Army & Navy E flag 15 March, 1943 and their production record maintained this symbol of excellence throughout the war years. This labor was responsible for outstanding success in savings bond drives. In every one of the seven drives the arsenal exceeded the assigned quota.

An adjacent housing project, constructed with the arsenal, was valuable in promoting employee morale. At one time the housing project of 986 units housed a population of approximately 4,000 people. This facility enabled employees to live with their families near their work and simplified recruiting of labor. The project has again demonstrated its value during the recent rise in employment. At the present time there are 2,200 people residing in government houses on the site. This population represents civilian and military personnel and their families. Incorporated in the housing project is a school system, grocery store, barber shop, beauty shop, bowling alley, cafe, cleaning shop and fire station. There is a civic association with membership limited to residents that is active in planning social events and promoting the welfare of the community.

The arsenal commander at the beginning of construction was a field officer, and Colonel A. M. Prentiss served in that capacity until 1 December, 1942 when the rank was changed to a general officer. Colonel Prentiss was promoted to Brigadier General at that time and served as commanding general of Pine Bluff Arsenal and Midwest Chemical Depot until 30 July, 1945 when he was assigned duties in the office of Chief Chemical Officer. General Prentiss had guided the arsenal from the breaking of ground to completion, and through three years of war. During his command every schedule assigned the arsenal was met on time.

On 17 May, 1943 the arsenal operations office was activated and Colonel H. M. Black directed this activity throughout the heavy production days of the arsenal. Colonel Black was responsible for all matters pertaining to the industrial operations of the arsenal, and coordinated

and supervised the work of administration division, production division and engineer and service division. The organization set up by Colonel Black is still operating at Pine Bluff Arsenal in essentially the same manner as originally planned.

Brigadier General William C. Kabrich assumed command of Pine Bluff Arsenal and Midwest Chemical Depot 6 August, 1945 and served in that capacity until 31 December, 1945 when he received a medical discharge from the army. General Kabrich was commanding general at the end of the war and directed the closing down of the plants and made preparations for a standby arsenal.

On 1 January, 1946 Colonel W. A. Copthorne assumed command of the arsenal and served in that capacity until his retirement 31 October, 1949. Colonel Copthorne brought to Pine Bluff Arsenal a wealth of military experience accumulated thru 33 years of regular army service, of which 23 years had been in the Chemical Corps. During his command the majority of the leases in effect at the arsenal were consummated and the prestige of the arsenal was increased through his intense interest in community affairs particularly as they applied to the arsenal and the city of Pine Bluff.

Lt. Colonel Harrison S. Markham succeeded Colonel Copthorne as arsenal commander, 1 November, 1949 and continues to serve in that capacity. Lt. Colonel Markham graduated from the United States Military Academy in 1931 and served on various infantry assignments until September, 1940, when he transferred to the chemical warfare service. During the period of the last war, he commanded the 84th Chemical Mortar Battalion in North Africa and Italy. Following termination of hostilities, among routine assignments he studied for two years at Harvard University and earned a master's degree in business administration. In 1948--1949 he was a student at the Naval War College, Newport, Rhode Island, coming to Pine Bluff Arsenal in June, 1949.

Lt. Colonel Arthur H. Williams, Jr. is presently serving as comptroller. Lt. Colonel Williams received his Bachelor of Science degree in chemistry from Middlebury College in 1935. He was appointed 2nd Lt., CWS, ORC in August, 1937 and entered on extended active duty 5 September, 1940. During the last war he served in the Southwest Pacific theater on the general and special staff of HW USASOS SWPA with duties principally in the fields of logistics and base planning. He was appointed to the regular army in June, 1947. His post-war duty has included assignment as executive officer, material planning division and chief, requirements and supply control at Washington and Army Chemical Center. Before coming to Pine Bluff, Colonel Williams has been on a two years detail as a student at the University of Pennsylvania, where he received his masters degree in business administration, and a five months tour of observation and study of managerial procedures at the Armstrong Cork Company, Lancaster, Pennsylvania.

The present executive officer is Major Thomas W. Rogers. Major Rogers graduated from the University of Alabama with bachelor of arts degree in chemistry; and from Peabody College with master's degree. Appointed 2nd Lt., Coast Artillery Corps, ORC, 15 May, 1922; extended active duty service 1 November, 1940; routine assignments included S-4, station complement, Camp Blanding, Florida; chief of administration, Atlanta Chemical Warfare Procurement District; liaison officer, Office of the Chief Chemical Officer and the office of Provost Marshal General on Internal Security; staff officer, G-2 Section, GHQ, FEC; executive officer, Pine Bluff Arsenal; graduate of basic course, Chemical Corps School; fire prevention engineering course, Massachusetts Institute of Technology; and safety engineering course, New York University.

Major Edwin A. Limbaugh is chief, Midwest Chemical Depot. Major Limbaugh graduated from New Mexico A. & M. with bachelor of science degree in biology. He was appointed 2nd Lt., Inf., ORC, in May, 1929 and entered on extended active duty service 11 August, 1942. He was stationed at Edgewood Arsenal with routine assignments in E. & S. Division; chief, Property Division, etc. In 1945 he attended University of Virginia Military Government School, and C.A.T.S. at Northwestern University at Chicago. He served 40 months as military governor of a prefecture in Japan, returning to Army Chemical Center in June, 1949, and was assigned to Pine Bluff Arsenal in September, 1949 as chief of Midwest Chemical Depot.

Major Charles A. Morgan, Jr. is presently serving as arsenal operations officer. Major Morgan graduated from Municipal University of Wichita, Kansas, 1936, appointed 2nd Lt. Cml. Warfare Service, ORC, June, 1939 and entered extended active duty under the Thomasson Act on 1 December, 1939. He was stationed at Edgewood Arsenal with assignments to 412 Chemical Depot Company, 2nd Separate Chemical Mortar Battalion and Chemical Warfare School. He attended the line staff officers course at the Chemical Warfare School, graduating in 1940. Upon graduation he was made a member of the faculty until May, 1941 at which time he was assigned to the headquarters, Philippine Department as an assistant to the chemical officer. During the early stages of the war in the Philippines, he served as an assistant to the chemical officer on USAFE and later USFIP until the surrender of Corregidor in May, 1942. He was captured at Corregidor and spent the remaining portion of the war as a prisoner of war of the Japanese until liberated September, 1945. Post-war duty included assignment on the Chemical Corps Board where he was a member for Weapons Division. He was appointed to the regular army in June, 1947. Before coming to Pine Bluff Arsenal, he attended a two-year detail as a student at the University of Michigan where he received a master's degree in business administration, specializing in industrial management and a year tour of duty with the Monsanto Chemical Company, St. Louis, Missouri, studying and observing the Monsanto organization.

Civilians test firing 4.2 mortar at Pine Bluff. Note the shell in mid-air.

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TIME-SAVING IN PROCUREMENT

During fiscal year 1952, the Chemical Corps will have millions of dollars available for the procurement of chemical warfare munitions, equipment and manufacturing services for the Armed Forces. Since 90% of the items contracted for by the Chemical Corps do not have a civilian counterpart, the dissemination of information regarding possible contracts poses a large problem.

Recently, Major General A. C. McAuliffe, the Army's Chief Chemical Officer, announced a new industrial liaison plan for procurement matters which has been designed not only to solve this problem, but also to save manufacturers much time and effort when they seek data regarding items which their plants may be able to manufacture. The procurement program is under the supervision of Colonel Henry M. Black, Assistant Chief Chemical Officer for Materiel.

Under the plan, all requests for preliminary information concerning procurement contracts, the allocation of facilities for procurement, and procurement planning should be taken direct to the Chemical Corps Procurement District office controlling the area in which the facility is located.

The Chemical Corps has divided the United States into six geographical districts with headquarters in Boston, New York, Atlanta, Chicago, Dallas and San Francisco. Each of these district offices now maintain complete sets of drawings and specifications for all standard items now being procured by the Chemical Corps. As a result, a manufacturer whose firm is located within the New England area, for instance, may now go to the Boston district office and study drawings and specifications for any item which the Corps is purchasing, regardless of which office is issuing the contract. He can examine these drawings and specifications and determine whether or not he can produce such items. Based upon this prior knowledge, he may then go to the district actually engaged in contract awards and conduct further negotiations. However, for his preliminary examination there is no need for him to travel, other than to his nearest Chemical Procurement District office. This procedure should prove extremely useful, particularly as the Chemical Corps' program appears to be increasing rather than decreasing, affording manufacturers more and more opportunities for contracts.

The Chemical Corps Procurement Districts and location of their headquarters are:

Boston Chemical Procurement District, Boston Army Base, Boston 10, Mass.—Maine. New Hampshire, Vermont, Connecticut, Rhode Island and Massachusetts.

New York Chemical Procurement District, 111 East 16th St., New York 3, N. Y.—Pennsylvania, Virginia, West Virginia, New Jersey, Delaware, Maryland and New York.

Atlanta Chemical Procurement District, 114 Marietta St., N. W., Atlanta 3, Ga.—North Carolina, South Carolina, Tennessee, Alabama, Mississippi, Florida and Georgia.

Chicago Chemical Procurement District, 226 West Jackson Place, Chicago 6, Ill.—Kansas, Nebraska, North Dakota, South Dakota, Minnesota, Michigan, Wisconsin, Indiana, Ohio, Kentucky, Iowa, Missouri, and Illinois.

Dallas Chemical Procurement District, 1114 Commerce St., Dallas 2, Texas—Arkansas, Louisiana, Oklahoma, Colorado, New Mexico and Texas.

COLONEL HENRY M. BLACK
Assistant Chief Chemical Officer for Materiel

San Francisco Chemical Procurement District, Oakland Army Base, Oakland, Calif.—Montana, Idaho, Wyoming, Nevada, Arizona, Washington, Oregon, Utah and California.

Chemical Corps Procurement Agency, Bldg. No. 1, Army Chemical Center, Md.—All 48 states on contracts for research and engineering, preparedness measures, and local procurement for Army Chemical Center.

The Chemical Corps' plan for procurement sets up a policy mainly of end-item buying. This purchasing responsibility has been decentralized to the various districts which are now responsible for the procurement of certain classes of items. Each district has nation-wide responsibility for the procurement of the items for which it is assigned.

The Boston office is charged with the responsibility for procurement of individual and collective protective devices which are to be used as a defense against chemical, biological, and radiological agents (the Chemical Corps has been assigned the responsibility within the Department of Defense for all defensive measures in these fields). These items include gas masks, hoods, group protectors—such as types that would be used in hospitals—respirators and other similar devices.

New York procures, mainly, flamethrowers, chemicals such as bleaches, decontaminating solutions, certain types of grenades and napalm, which is seeing such extensive use in Korea. The Atlanta office contracts for white phosphorous, identification kits and similar items which will enable us to detect the usage of chemical agents. Chicago procures decontamination apparatus and certain types of incendiary bombs, while the Dallas office obtains the major portion of the metal parts which are used in manufacturing incendiary bombs made with magnesium. Dallas is also concerned with the procurement of white phosphorous grenades and smoke munitions. The San Fran-

cisco office is charged with the procurement of such items as smoke generators and tear gas grenades. The Corps Procurement Agency at the Army Chemical Center, Md., is handling procurement for Edgewood Arsenal as well as research and engineering contracts and contracts for industrial preparedness measures.

In breaking down the procurement requirements, the Chemical Corps has tried to decentralize the load in such a manner that the manufacturers in all parts of the United States will be able to participate in the procurement programs, regardless of geographic locations.

In addition to the basic procurement responsibility, the district offices have another function. Each office supervises Chemical Corps contracts that may be placed in that area. As an example, Chicago is responsible for the inspection and acceptance of material for Chemical Corps' contracts in the north central states. Thus, although the contract for a number of gas mask canister component parts has been placed with a Wisconsin manufacturer by a prime contractor for gas masks through the Boston office, the Chicago district is responsible for the inspection and acceptance of these gas mask canisters.

While contracts placed by the Corps are primarily for end items which will be produced by a prime contractor, in general, everyone of these contracts requires considerable subcontracting. To participate in the program as a subcontractor, manufacturers should go to those concerns which have been awarded the prime contracts. However, there are a certain number of contracts placed by the Chemical Corps which will not be for end-items. Such awards are mainly for component parts of items which will be manufactured in the Corps' own arsenals, or for spare parts which are available as commercial items. The individual procurement offices have full information on such opportunities to do business, including contracts known as industrial planning studies, which are placed to assist the Corps in developing production means for newly-developed items.

Prior to the outbreak of the Korean war, Chemical Corps procurement was almost at a standstill, and purchasing was limited mainly to maintenance of stockpiles. However, the districts were busily engaged in procurement planning, surveying their areas for potential contractors and helping the manufacturers to draw up plans for Mobilization Day changeovers to military production. This procurement planning is still being carried on, but on a speeded-up basis.

Until President Truman declared a national emergency on December 16, 1950, procurement was carried on by formal advertising, sealed-bid procedure, with rare exceptions. Awards were made on a strict price basis, with little opportunity for the Corps to take into account planned suppliers or to evaluate production capabilities. The procedure is excellent for stock-type, off-the-shelf items, but is not adapted to the many purely military items which have no civilian counterpart.

With the declaration of a national emergency this situation was improved to a great degree. The Armed Services Procurement Act had provided for such a contingency and authorized negotiation as a normal method of contracting upon declaration of a national emergency and determination of necessity by the Secretary of the Army.

As a result, the Corps is now able to negotiate with individual industrialists in such a manner as to allow spreading of contracts and avoid concentration of the manufacturing of any single item within one particular section of the country. However, competition must be achieved and negotiations are not carried on "behind closed doors."

The Chemical Corps is obliged to obtaining the fairest price possible to the government and at the same time spread military procurement over as wide a basis as possible, giving particular attention to the position of the small business in terms of giving them a maximum opportunity to participate. In order to maintain competition, the procurement agencies contact several known sources who qualify as producers of the item being procured. These sources include not only the planned suppliers for the item, but also qualified sources which have developed on the basis of visits to procurement district offices, experience in production of similar items, or recommendations of other districts.

After the sources that have been contacted have submitted their proposals, including price breakdown information, the Corps proceeds to negotiate a contract, working principally with the two or three firms whose initial proposals were the most advantageous. At the conclusion of the negotiations, a contract is awarded to the concern making the fairest proposals in the competition for the work.

The districts are under orders to speed up all negotiations so as to reduce the time between authorization for negotiating a contract and the actual award of the contract. A manufacturer can do his part in expediting such negotiations by having the following information at hand the first time he visits a procurement office in quest of information:

1. Description of facilities including various types of equipment and machinery.
2. Short histories of key personnel.
3. Security clearance of personnel and facilities, naming the agencies granting the clearance and when they were granted.
4. List of other government contracts handled by the facility.
5. References (Dunn and Bradstreet, Thomas Register, etc.) on financial status of facility.

The availability of the above at the time of the first inquiries will aid in the more expeditious handling of the subject and a quick "yes" or "no" on whether the Corps can include the individual facility in its plans.

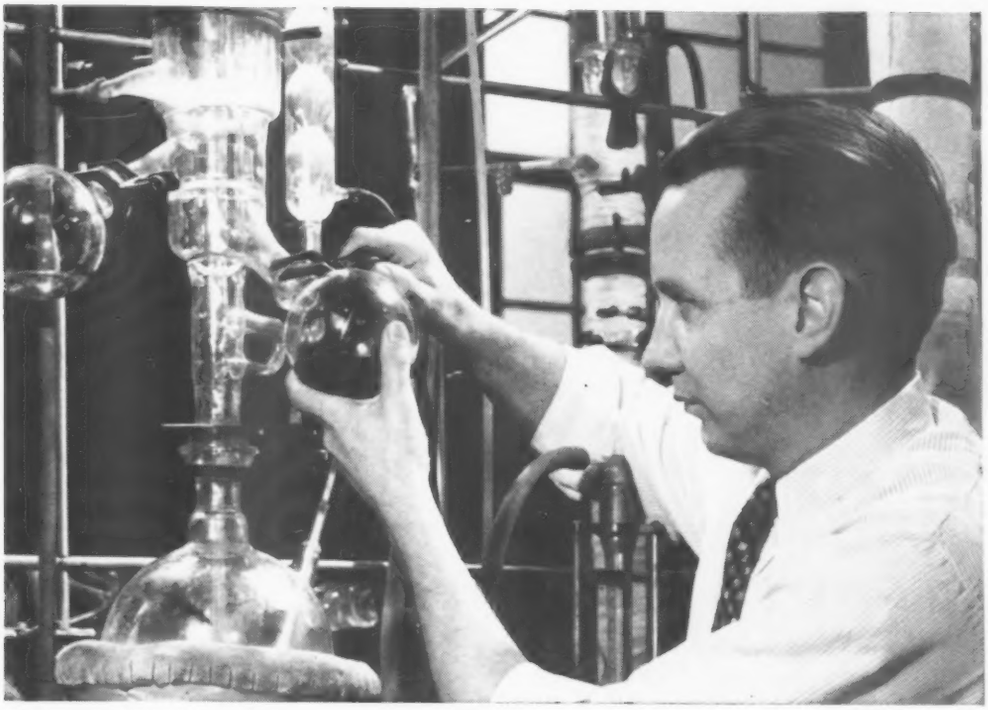
Under the unification of the armed forces policy, the Chemical Corps also has the responsibility of procuring or manufacturing all incendiary bombs for the Air Force, and procuring a great deal of material for the Navy, especially the types of equipment for the Marines which are similar to those furnished the Army.

Also in the interests of unification, there are available at the Chemical Corps procurement offices, weekly reports naming contractors awarded Army, Navy and Air Force contracts of $25,000 or more. This is a Department of Defense service for potential subcontractors and this information is also available through the Department of Commerce, Armed Forces field offices, and all Army, Navy and Air Force purchasing offices now serving as outlets for procurement information. It provides the businessman a weekly synopsis of unclassified contracts, whether negotiated or formally advertised, and is especially useful as a guide for subcontractors.

At the same time the procurement offices are cutting the time consumed between the availability of funds and the awarding of contracts, every effort is being made to minimize unemployment and lags in production incident to the current industrial mobilization. The Corps, like other defense agencies, is following out the orders of the Secretary of Defense, as far as possible, in the need for speed in placing contracts and for developing an adequate production base for later increase.

(Continued on Page 32)

to serve you better . . .



Research

Research is never satisfied! Belief in research creates the vision and unceasing activity that has guided the chemical industry to vast new discoveries, to the new and better products which serve so many.

In 1915, Dow research made it possible to extract the light weight metal *magnesium* from the brine pumped from Michigan brine wells. And in 1941, when Dow began extracting magnesium from the inexhaustible supply in the ocean, the most important single part used in the extraction process was the electrolytic cell . . . developed as the result of *28 years* of continuous research. Today, thousands of engineers design and build everything from airplanes to trucks with magnesium, the lightest of structural metals.

Dow chemists developed Dowtherm, a heat transfer medium, whose use in industries such as nylon, plastics, food and many others makes possible better end products. Research developed the Dowicides—industrial germicides and fungicides which enable industry to reduce production stoppages. The many Dow agricultural chemicals which insure the health of America's "breadbasket" were developed and improved by constant research. In fact, all Dow chemicals—over 600 of them—owe a debt to the research which made them possible.

Dow research is comprehensive and continuous. Nothing is too small to examine . . . nothing too large to explore. It is Dow's sincere conviction—borne out by over 50 years of experience—that the company can best fulfill its function of usefulness by searching for *more* ways to serve *more* people!

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

DOW

CHEMICALS

INDISPENSABLE TO INDUSTRY
AND AGRICULTURE

Part of Foreign Gas Mask Collection in Technical Command

DEFENSE AGAINST GAS WARFARE AGENTS

By SAUL HORMATS
Chief Engineer
Protective Division, Technical Command
Army Chemical Center, Md.

The first use of gas by the Germans against the British was successful because the British troops were unprepared and unprotected. Gas masks were only issued to the British, on May 3, 1915, about 3 weeks after the German attack. These masks were essentially cloth pads impregnated with substances to react and remove chlorine gas. The first impregnants were a combination of sodium carbonate and sodium thiosulphate. Masks utilizing a somewhat better absorbent, a combination of sodium carbonate and sodium thiosulphate plus sufficient glycerine to keep the pads moist, were provided the following month. For protection against phosgene, introduced by the Germans in December 1915, the British first used a combination of sodium phenate plus glycerine, and later sodium phenate plus hexamethylenetetramine after the value of the latter as a reactant for phosgene was discovered by the Russians.

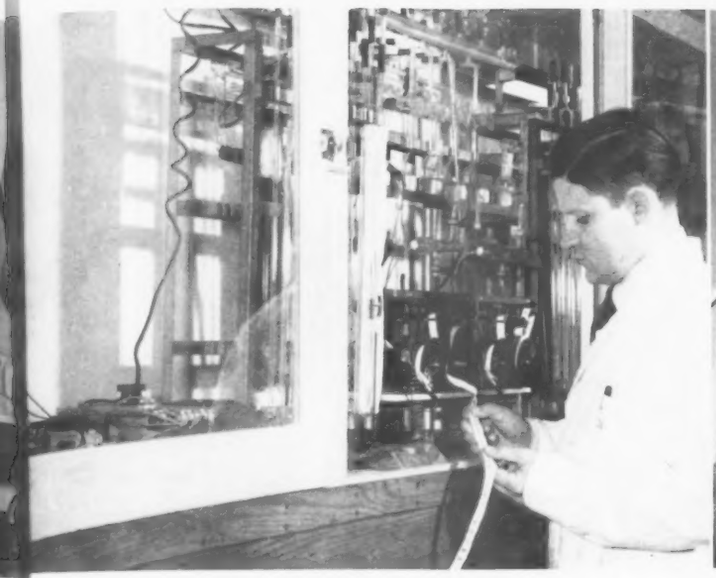
The principle of the early types of respirator was adequate as long as known and reactive gases were encountered and reactants could be provided beforehand to combine with these gases. Because of the possibility of attack with new and with relatively non-reactive agents a different principle of protection was needed. Masks with canisters containing activated charcoal, an adsorbent which did not depend on specific chemical effects for its action, were soon adopted by all the belligerents.

German gas masks utilizing activated charcoal appeared in the autumn of 1915. Allied masks of this type appeared in February 1916. Since activated charcoal adsorbents were realized to possess by themselves poor capacity and retentivity for certain volatile, acid-type gases such as hydrogen cyanide and phosgene, a mixture was used of activated charcoal plus alkaline granules (soda lime) for absorbing and retaining these gases. Further, oxidizing properties were imparted to the mixture through the addition of permanganate to the alkaline granules. Oxidizing properties were desired primarily for protection against possible attack with arsine as this particular gas is not significantly adsorbed by activated charcoal or reacted with by alkaline granules alone.

An ideal respirator adsorbent is one (a) which removes all toxics from air rapidly, (b) adsorbs and retains large quantities of toxics, (c) is easy and cheap to manufacture, and (d) is stable in the presence of air, CO_2 and moisture. The World War I adsorbents were deficient in several of these respects, particularly in ability to adsorb and retain cyanogen and cyanogen chloride, and in stability in the presence of moisture. Following World War I, most of the world's military establishments conducted secret and independent studies of activated charcoal and other adsorbents, seeking to correct these deficiencies. In each case these studies eventually took the direction of adding impregnants to activated charcoal, as each found that in this way charcoal could serve as a carrier for catalysts and reactants while having its general sorptive properties essentially unimpaired. By World War II, the military respirators of all the belligerents contained some form of impregnated activated charcoal as the adsorbent. Typical of these is the German Army respirator which contained activated charcoal impregnated with copper and copper oxide for reaction with gases such as phosgene and hydrogen cyanide, silver for the catalytic oxidation of arsine, and pyridine for reaction with cyanogen chloride.[1]

Military respirators are required to protect against toxic particulates as well as toxic gases. As the filtration of particles by beds of granules is of a low order, a mechanical filter is required. The first aerosol filters, made necessary by the introduction to warfare of diphenylchloroarsine, were cotton pads. Layers of filter paper, rolls of tissue paper, and many other similar devices have been used. The most useful of the early materials was felt, but this filter was expensive, difficult to manufacture, and, most important, offered an unduly high resistance to breathing by the wearer of a mask. More modern military respirators employ fibrous filters for restraining particular toxics, the smaller the diameter of the fiber the more effective the filtration. Most modern (e.g., German, Japanese, U. S. A.) military respirators employ filters of fibers of finely subdivided asbestos supported on porous filter paper for strength and rigidity.

The amount of protection given by a respirator canister depends upon the activity and capacity of the adsorbent.



Tape recorder used in testing protective clothing

Optical Perimeter for determining range of vision of gas mask eyepieces

The activity is a function of the rate of adsorption and is measured approximately at a given flow rate and concentration of gas by the reciprocal of that depth of bed of adsorbent which just permits instantaneous penetration of gas. The capacity of an adsorbent is the weight of gas restrained per unit volume of adsorbent when equilibrium is reached at a given concentration of gas. Because of the independent effects of activity and capacity on the amount of gas restrained, it has been found not possible to obtain from a single test an indication of the value of an adsorbent in a canister against various gases and under various breathing rates. For this reason, it is desirable to conduct performance tests of respiratory canisters under conditions simulating as closely as possible those likely to be encountered in actual use.

During World War I tests were made with men wearing masks in an atmosphere of toxic gas. To facilitate the test procedure, a mechanical method was developed in which air containing a known concentration of toxic was passed through the canister at a continuous flow rate of 32 liters per minute, a value considered an average breathing rate for men doing moderately heavy work. More recently[2] a comprehensive study of instantaneous respiration rates of men doing heavy work showed that the maximum rate may be several times 32 liters per minute. For canisters containing thin beds of adsorbents, and for adsorbents of low activities, these high instantaneous rates may be sufficient to cause an immediate breakdown of canisters which continuous-flow tests may have shown to be satisfactory. In such cases, mechanical breathing devices are used which simulate the breathing rates found to correspond to the following degrees of exertion:

Degree of Work	Respiration Rate	Total volume of air per minute	Part of total cycle during which inspiration occurs	Peak instantaneous
	Respirations per minute	Liters	%	Liters per min.
Light	25	22	48	70
Medium	27	33	50	95
Heavy (can be maintained for 30 min. only)	29	44	51	126
Maximum (can be maintained for 10 min. only)	29	63	51	176

The canister is that part of the gas mask which purifies the air inhaled by the wearer. In addition to purifying air of toxics, military gas masks must be simple and easily used, sufficiently rugged to withstand the rough treatment to which military equipment is subject in the field during combat, and interfere as little as possible with the vision, mobility, fighting power, and identification of the wearer. The face-piece of the first German canister-type respirators was made of leather treated with oils and tallow for flexibility and gas-proofness. The entire face was covered and glass eye pieces were provided for vision. There were no valves for controlling the airflow, the air being both inhaled and exhaled through the canister. From this beginning, masks have been developed by all countries with facepieces of rubber and in which valves release the exhaled air directly into the atmosphere so that the soldier does not have to rebreathe his expired air, and in which the inspired air is first drawn over the eyepieces to free them from fogging. Masks are available to most armies with diaphrams for transmitting the voice, with provisions for inserting microphones, and with special eyepieces for use in operating optical instruments.

Gas masks protect the eyes and respiratory tract only. Mustard gas and the nitrogen mustards attack the skin as well. For protection against agents of this type, protective clothing and special ointments have been developed. The clothing is of two types. An impermeable type, made from oil or rubber coated fabric, is issued to troops engaged in decontamination work where exposure to high concentrations of vapor or to liquid agents may be encountered. This clothing can be worn for only a short time because of the physiological effects on the wearers. Permeable clothing is made from cloth impregnated with various substances which absorb or react with the toxic agents. Such clothing is issued to troops generally. The cloth is almost as porous as unimpregnated fabric, imposing little additional heat load on the wearer. Impregnants have also been developed for treating shoes. Troops supplied with masks, impregnated underwear, uniform, and gloves, and treated shoes may be exposed to mustard vapors for hundreds of hours without suffering casualties, the time limit depending upon the concentrations of gas involved. Comparable protective equipment has been developed for military animals such as horses, dogs, mules.

Gas-proofing of shelters may be accomplished in two ways, either through the use of air tight construction, or by maintaining a positive pressure of purified air within the shelter so that air escaping from cracks prevents the entrance of the gas. With modern armies, the former method is generally only a field improvisation as for gas-proofing dugouts and caves with gas-tight doors and curtains of wet blankets. The latter method is used for larger fortifications, field hospitals, and similar semi-permanent and permanent constructions. The purified air is obtained with mechanical blowers drawing air from without the shelter and passing it through canisters similar to but much larger than those for individual respirators. Blowers are designed for electrical operation if a source of power is available, by gasoline engine if not, and in some designs manually if other sources of power fail. These large-scale air purifiers are called collective protectors.

The number of persons that can occupy safely an unventilated shelter depends upon the surface area as well as the free space of the shelter. The number accommodated in an unventilated shelter in temperate climates is indicated by the following table:[3]

Dimensions of Room ft.	No. of Persons Permitted	
	Up to 3 hrs.	Over 3 hrs.
10×10× 8 high	7	5
15×10× 8 high	9	7
20×15×10 high	17	13
30×15×12 high	26	20
50×20×15 high	55	41

The number of permissible occupants of a ventilated shelter and the ventilation required, are given in the following table:

Period of occupation		Shelter Below Ground		Shelter Above Ground	
		Total surface area of shelter per occupant	Ventilation per occupant	Total surface of shelter per occupant	Ventilation per occupant
		sq. ft.	cu. ft./hr.	sq. ft.	cu. ft./hr.
3 hr.	if actively engaged	30	450	20	450
	if quiet	40	150	20	150
Indefinite		50	450	25	450

Areas which have been attacked with those agents of low volatility known as the persistent gases (see Article on Gas Warfare Agents) may remain contaminated for prolonged periods under favorable conditions of temperature and humidity. Materials are available which can react with and destroy these agents and thus shorten the period of persistence. The best decontaminant for mustard is calcium hypochlorite, known as bleach, which is also of value in destroying various other chemical contaminants. However, to be effective approximately one pound of hypochlorite per square yard of contaminated terrain is required so that for reasons of supply decontamination is generally limited to equipment and to key points such as road blocks and contaminated inhabited areas. For defense against vapors from a widespread area of contamination, recourse must still be had to individual and collective protectors.

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[3]Waitt, Alden H., *Gas Warfare*, Duell, Sloan and Pearce, New York (1942).

PROCUREMENT

(Continued from Page 28)

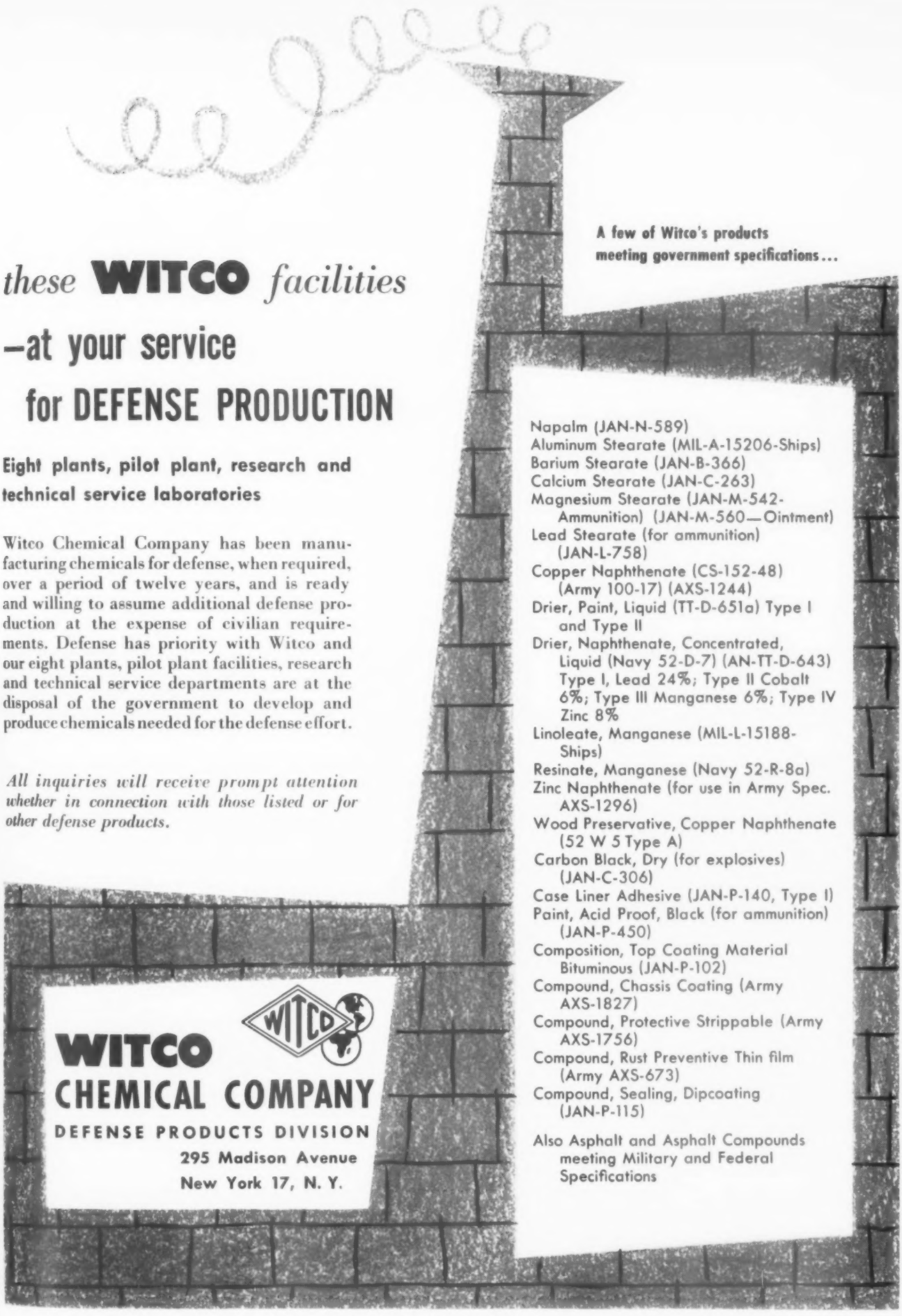
This is one of the several moves being made by the Department of Defense to cushion the impact of conversion to defense production by American industry.

Under this speedup plan, items which can be made faster are scheduled so as to keep pace but not outrun the others. A build-up of huge stocks in advance of needs would create unnecessary shortages and interfere with the production of more urgently needed material, according to Munitions Board Chairman John D. Small.

During the rest of the fiscal year and that of 1952, the Department of Defense expects to spend 87 billion dollars on defense procurement. This figure is over and above housekeeping expenses such as pay, transportation, and other personal costs of the armed forces.

This two-year volume of orders will be placed by June 30, 1952. In accordance with the mobilization plan, procurement will be placed so as to cover immediate needs of the services at the earliest possible date, while at the same time providing production lines capable of meeting the demands of full mobilization. The aim is to have enough on hand at all times to meet immediate needs, while avoiding accumulation of huge stockpiles of equipment which may become obsolete, or the need for which may never arise.

Weatherometer for determining the weatherability of war gas protection items by subjecting them to artificially-created stringent weather conditions.



these **WITCO** *facilities*

–at your service for DEFENSE PRODUCTION

Eight plants, pilot plant, research and technical service laboratories

Witco Chemical Company has been manufacturing chemicals for defense, when required, over a period of twelve years, and is ready and willing to assume additional defense production at the expense of civilian requirements. Defense has priority with Witco and our eight plants, pilot plant facilities, research and technical service departments are at the disposal of the government to develop and produce chemicals needed for the defense effort.

All inquiries will receive prompt attention whether in connection with those listed or for other defense products.

A few of Witco's products meeting government specifications...

Napalm (JAN-N-589)
Aluminum Stearate (MIL-A-15206-Ships)
Barium Stearate (JAN-B-366)
Calcium Stearate (JAN-C-263)
Magnesium Stearate (JAN-M-542-Ammunition) (JAN-M-560—Ointment)
Lead Stearate (for ammunition) (JAN-L-758)
Copper Naphthenate (CS-152-48) (Army 100-17) (AXS-1244)
Drier, Paint, Liquid (TT-D-651a) Type I and Type II
Drier, Naphthenate, Concentrated, Liquid (Navy 52-D-7) (AN-TT-D-643) Type I, Lead 24%; Type II Cobalt 6%; Type III Manganese 6%; Type IV Zinc 8%
Linoleate, Manganese (MIL-L-15188-Ships)
Resinate, Manganese (Navy 52-R-8a)
Zinc Naphthenate (for use in Army Spec. AXS-1296)
Wood Preservative, Copper Naphthenate (52 W 5 Type A)
Carbon Black, Dry (for explosives) (JAN-C-306)
Case Liner Adhesive (JAN-P-140, Type I)
Paint, Acid Proof, Black (for ammunition) (JAN-P-450)
Composition, Top Coating Material Bituminous (JAN-P-102)
Compound, Chassis Coating (Army AXS-1827)
Compound, Protective Strippable (Army AXS-1756)
Compound, Rust Preventive Thin film (Army AXS-673)
Compound, Sealing, Dipcoating (JAN-P-115)

Also Asphalt and Asphalt Compounds meeting Military and Federal Specifications

WITCO CHEMICAL COMPANY
DEFENSE PRODUCTS DIVISION
295 Madison Avenue
New York 17, N. Y.

A Symposium on

INTERNAL INDUSTRIAL SECURITY

Conducted by the Chicago Chapter of AFCA

Business firms in this area sent from 4 to 15 top-ranking executives to take part in the afternoon advisory sessions and the evening banquet of the Chicago Chapter, Armed Forces Chemical Association. President Lawson was also present to honor three Chicago Chemical Procurement District personnel and two industry members with the achievement plaque of the Association.

Three hundred and twenty persons stayed to dinner to fill to capacity the Grand Ballroom of the Knickerbocker Hotel, Chicago, and scores of others visited during the day to attend the Symposium on Industrial Security, staged by the Chicago Chapter of the Armed Forces Chemical Association.

These large numbers are not surprising when we review that this same group, just six months ago, staged a dinner meeting with General Anthony McAuliffe present as speaker—at which event there were gathered a notable representation of 500 leaders from the military establishment, commerce, science and industry.

It will be noted that business firms in this area sent from 4 to 15 top-ranking executives to listen to discussions during the day, to take part in the advisory sessions in the afternoon and to attend the banquet in the evening.

Chicago Chapter's President G. M. Glidden welcomed the session's speakers and the military, business and scientific groups. He gave the background of the Association and outlined the scope of the present symposium.

Following President Glidden, Mr. Lewis Terry, Chairman of the Program Committee of the Chicago Chapter explained the events which resulted in the establishment of the Symposium. The various papers were then presented. Thereafter a reception was held, followed by the dinner. Mr. George R. McSwain, of the Chicago Field Office of the FBI, spoke after dinner.

The JOURNAL considers this Symposium an event of outstanding importance, and a splendid accomplishment by the Chicago Chapter.

The various papers presented are here published in a somewhat condensed form.

THE CHICAGO CHAPTER'S SYMPOSIUM

By MR. LEWIS TERRY

Corn Products Refining Co., Argo, Illinois

What can we do to help our group members and their industrial neighbors in this time of national and international difficulties? This is the question the board of directors asked itself last fall following the successful McAuliffe dinner. We wanted to do a real job that would be worthwhile and would reflect creditably on the Association. Aspects of civil defense were discussed and dropped because the board felt that the subject was too broad and was not helpful specifically to our group members. We thought an internal industrial security symposium was the answer.

Firms with military contracts are often suddenly faced with the necessity of expanding their facilities and plans for internal security. Sometimes security requirements for military contracts are new to them and are adopted only with considerable difficulty. Other industries which do not have military contracts but whose operations are no less vital to the national defense and welfare never realize the need to improve their security set-up. Too often they don't know and haven't the means of finding out what security-minded firms are doing or what can and should be done. Our Internal Industrial Security Symposium was planned to fill this need.

Obviously actual open enemy action against our industrial community would be the most serious obstacle to the preservation of personnel, production, and property. But we knew Americans have had experience only as observers of bombing damage. Then we realized that the Texas City, Texas disaster of April, 1947 was a situation much like damage from enemy air action. In Texas City, American industry had faced a disaster situation much like that which our own industrial community would face if an atom bomb were dropped on Chicago. We found Mr. Harvey B. Williams of the Pan American Refining Company who had lived and worked through the Texas City catastrophe, to tell us what industry here might (we hope never) have to deal with. We found Dr. Austin Brues of the Argonne National Laboratory to help on the problems peculiar to an atom bomb attack which industry would have to face. Thus, dealing with the disaster situation resulting from actual enemy attack was the first phase of our Symposium.

What could our industrial community do before such disaster struck to be prepared better to weather it? What could companies do to thwart undercover enemy efforts against personnel, production, and property? These questions were the second phase of our symposium. From the Dow Chemical Company we asked Lt. Col. Tyrone Gillespie to advise how as Dow's security officer he had organized and developed internal security in his company. Colonel Gillespie had held a symposium in September, 1950 for Dow at Midland, Michigan dealing with these matters. Out at Cicero, the erstwhile notorious suburb of Chicago, the executive secretary of the Cicero Manufacturers' Association, Mr. Walter I. Lerche had organized the efforts of that municipality and industrial community toward finding evidence of and participants in undercover communist subversive activities in plants there. He would tell our group members and their industrial neighbors what they could do to ferret out enemy agents and their

paid puppet helpers. Could run-of-the-mill employees be expected to react favorably and even help, with all this detective work and preparation going on about them? Lt. Col. Francis M. Wright of International Harvester Company would tell us how his firm sells security to its employees.

We planned that these men would present their information during most of an afternoon. We wanted also to have a dinner to consolidate socially the knowledge gained during the afternoon and to provide a personal foundation for further cooperative work. Mr. J. Edgar Hoover of the F.B.I. appointed Mr. George M. McSwain, Agent in charge of the Chicago office, to address our gathering following the dinner.

We realized that many of the people attending our symposium would be specialists in some aspect of this overall problem of industrial security. How could we make available to all those in attendance, the experience of these experts? Between the afternoon session and the banquet, we arranged a reception period at which our speakers and the specialists were assigned to definite consultation stations conveniently situated in the meeting area. Consultation specialists on (1) disaster situations, (2) atomic information and industrial hygiene, (3) company organization, and (4) subversives uncovery were assigned. Thus the symposium was planned.

How It Was Done

In our preparations we observed that many pamphlets and films were available on several aspects of industrial security. We included a list of these and the various interested organizations as a part of the printed program of our symposium. Copies of this are available by writing to 3037 West Lake Street, Chicago 12, Illinois.

How could we take our symposium to industry and obtain the response we wanted? A prospectus was prepared giving the purpose of the symposium and outlining the sort of information that would be available in each speech. Included was an order form for tickets. Several interested organizations mailed copies to their members along with a letter recommending the symposium. The Chicago Chemical Procurement District mailed copies to all of its contractors and potential contractors. Releases were prepared for newspapers and editors of 60 journals in the area. Such was the publicity for the Chicago Chapter Internal Industrial Security Symposium. The above efforts brought approximately 350 representatives of industry and the military to the Knickerbocker Hotel on February 15, 1951 for the symposium. It was remarkably well received.

There follows in abbreviated form the papers presented by the contributors to our Symposium.

"THE TEXAS CITY STORY"

By MR. HARVEY B. WILLIAMS

Safety Director, Pan-American Refining Co., Texas City, Texas

I would dedicate my story to the friend whose thinking saved me from the explosion, and to Texas Citians, both living and dead, who were victims of the disaster. They are the ones who would want their countrymen to know the terrors, the heartbreaks, and the struggles for survival that follow in the wake of the shock-wave of an accidental blast of industrial origin in peace time. They would sincerely hope that such knowledge might be the nucleus around which will grow plans for survival and protection against the most terrible war weapon the ingenuity of the mind of man has ever devised—the atomic bomb!

Texas City is situated where the flat coastal plains meet the waters of Galveston Bay, eleven miles from the Gulf of Mexico and about ten miles northwest and across the Bay from Galveston.

As the tides of the Gulf of Mexico flow and ebb in the ceaseless washing of the beaches, so did the fortunes of Texas City rise and fall. In April, 1947, 18,000 people had homes and earned a livelihood in the thriving city that boasted of five oil refineries, two chemical plants, the western hemisphere's only tin smelter, a sea-train terminal, and a world port in addition to the churches, schools, and business enterprises found in any city of comparable size.

On the morning of April 16, 1947, the sun rose in a cloudless sky and a gentle breeze out of the north fanned the little city. At eight o'clock that morning thousands of men and women had begun their daily tasks. In the harbor three great steamships, the *Grandcamp*, the *Highflyer* and the *Wilson B. Keene*, lay moored to the wharves taking cargo.

Harvey B. Williams
Pan-American Oil Company
Texas City, Texas

The *Grandcamp* was in the north slip, on the north side of which the huge towers and buildings of the Monsanto Chemical Company were situated, covering an area of approximately thirty acres. The ship was taking on fertilizer and other cargo to be transported to France.

Shortly after 8:00 o'clock that morning, smoke was noticed coming up between the side of the ship and the bags of fertilizer in No. 4 hold where there were 900 tons of fertilizer. After futile attempts were made to extinguish the small fire with drinking water and the contents of a soda-acid extinguisher, the men were ordered from the hold and were told to batten down the hatches preparatory to the introduction of steam into the hold to smother the fire.

To digress for a moment, texts state that ammonium nitrate under controlled laboratory conditions can be caused to decompose in several different ways, each with different degrees of intensity. Three reactions should be mentioned:

$2NH_4NO_3$ will react into $2N_2+4H_2O+O_2$ after being heated to a very high temperature, under pressure, and then a strong detonator is required.

$2NH_4NO_3$ into $N_2+2NO+4H_2O$ occurs with a weak detonator.

NH_4NO_3 into N_2O+2H_2O can occur when the salt is gradually heated with no marked increase in pressure. These are explosive reactions, the first mentioned being the most violent.

Returning to the ship fire, it is now necessary to relate my personal experiences at the waterfront in the immediate vicinity of the *Grandcamp* up to within five minutes of the initial explosion, in order to begin the picture I want you to see.

At about 8:30 o'clock on that fateful morning, I arrived at the waterfront to make a routine inspection of my employer's tanker loading facilities. I was with the Chief of Plant Protection. We stopped at the dockside cafe for coffee and while there our attention was attracted by a huge puff of deep orange smoke issuing from a hold of the ship as a hatch cover was blown clear. Not knowing

the nature of the cargo, my first thought was that perhaps a chlorine drum had ruptured and since the cloud of gas was drifting toward the property I had come to inspect, we left to warn employees working in that area.

As we left the cafe, three men were seen running from the ship in the direction of the town proper. I stopped one of them to ask the nature of the occurrence and his reply was, "some fertilizer is burning in number four hold and number five is loaded with munitions." He stated he was a member of the ship's crew. His fear was not of the ammonium nitrate, for he spoke of it as one might mention the common variety of barnyard fertilizer; yet it was proved that his fear was well-grounded for he lived while chemists stood and watched the fire only to be destroyed in the ensuing explosion.

In spite of this man's apparent fear of an explosion, we proceeded to our company docks about one-quarter mile south and instructed all persons there to leave the area, which was shrouded in the orange smoke. I was advised, in a telephone conversation with our company doctor in the refinery two miles toward the west, that the fertilizer must be ammonium nitrate and that the vapors could contain nitrous oxide. It was while telephoning that I was exposed to the smoke and I detected the odor of nitric acid.

We returned to the slip, where the *Grandcamp* was burning, to warn workmen there of the dangers of inhaling this orange smoke. In the meantime, the Texas City Volunteer Fire Department had responded to the call and were at the moment engaged in laying hose lines to reach the fire. Noting the conditions under which the firemen were working, a messenger was sent to the Fire Chief to determine if his men were equipped with gas masks and to offer use of masks we maintained at the refinery. Perhaps ten minutes had elapsed before the messenger returned to us with the word that masks were needed, as the men were then suffering from smoke inhalation. I immediately suggested telephoning from the cafe to have the masks delivered and it was at that moment my companion uttered the words that prevented both of us from becoming explosion victims. He reminded me that the public telephone system was crippled by a strike of operators, and stated, "we can save time by going after the masks ourselves."

The rising column of orange smoke drifting in the morning sunlight was a beautiful spectacle. The run of all of Texas City's fire trucks toward the docks had attracted the attention of hundreds of persons and within minutes the one street into the area was crowded with men, women, and children bent on securing a closer view or perhaps to take colored pictures of this most unusual sight.

Even as we left the dock with siren screaming and red lights flashing, it was necessary to push people out of the way for perhaps the first hundred yards before we could accelerate to emergency speed. It is odd, but I had more fear of the possible consequences of fast driving in city traffic than I had of an explosion. We covered the two and one-half miles of street distance to the refinery in three minutes and permission was secured immediately to loan the masks, when a terrific explosion occurred. At the instant, I was inside a brick office building and the effect on me was as though I had been struck across the shoulder blades with a baseball bat. I ran perhaps seventy-five feet to a point outside where I could have an unobstructed view toward the docks. A great column of smoke was shooting skyward, mushrooming out at an altitude of perhaps two thousand feet. Within ten seconds of the first explosion, a blinding flash appeared at the base of this column of smoke and then the second shockwave struck more violently than the first. The air was filled with debris visible even to those of us who watched from a distance of two miles.

To give you some idea of the terrific forces of those two blasts, several pieces of oil well drill stem, each measuring thirty feet in length and weighing two thousand, seven hundred and thirty pounds, were thrown into our refinery, a horizontal distance of two miles. One drill stem penetrated an 80,000-barrel tank of oil, but no fire resulted. In our tank farm, one and one-half miles from the waterfront, men later dug up a ship's anchor which weighed two thousand eight hundred and fifty pounds that had buried itself sixteen feet in the earth. Oil tanks that were empty collapsed like crushed paper bags from the concussion, while the ground shock was recorded on the seismograph in St. Regis College in Denver—nearly a thousand miles away.

I should perhaps mention the opinion of a former air force officer who, upon viewing some aerial pictures taken of Texas City after the explosion, remarked to me that he had flown over Nagasaki after the atom bombing and from a comparative view the devastation in Texas City, although not so widespread, was more complete.

Within a radius of one thousand feet from the explosion center, missiles ranging in weight from ounces to many tons were dispersed at distances of from three to four feet and most of them showed that they had been red hot.

Within seconds of the second blast, the entire Monsanto plant was enveloped in a sheet of flame. Black smoke from fires, fed by volatile products from broken lines and pierced vessels, shrouded the area of destruction and its hundreds of dead and dying.

Next in sequence was a flash of fire in the Stone Oil Company plant, situated three thousand, five hundred feet from the explosion center, as several tanks of oil ignited from hot missiles. By this time the pall of smoke was so dense that further progress of the fire could not be followed, but rumbling concussions and sudden billowing upward of the smoke cloud told the grim story as tanks in the Republic, Southport, and Sid Richardson refineries fed the flames.

To add to the horror, a miniature tidal wave washed ashore as the blast-emptied slip was refilled by water rushing in from the Bay with such force that a steel barge 150 feet long, was water-borne over the bulkhead and carried one hundred fifty feet inland from the water's edge. The dead, with the helplessly injured, and those who miraculously escaped serious injury, were as flotsam in an angry sea, and it is certain that this wave added to the toll of fatalities.

Texas City's fire department, both men and equipment had been destroyed. Electric power lines into the City had been blasted down and waterlines were broken in many places. The city stood helpless, with hundreds of its dwellings and business houses completely destroyed and many hundreds more severely damaged. Fate set a limit though, for the wind direction was favorable and only one small fire started in the residential and business sections of the city.

The population was stunned by the destruction every where and hundreds who had received injuries in their homes moved toward the clinics for treatment. No one realized just how many had been seriously injured until people who had been in the vicinity of the waterfront and who were still able to walk or crawl began to fill the streets. Grotesque figures they were; black with fuel oil and smoke, and red with their own and comrades' blood, walking, with arms broken and dangling, or crawling with mangled legs and feet.

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Striking telephone operators hurried to their vacant posts and the frantic call, "For God's sake, send help, there's been a terrible explosion," flashed over the lines to towns and cities for hundreds of miles.

Calls for volunteers to perform rescue tasks were broadcast; willing workers from surrounding towns rushed toward Texas City; fire trucks, ambulances and rescue teams sped to help, and within minutes the three highways leading into Texas City were jammed with vehicles. The willing and heroic, hurrying toward the disaster, were hampered and endangered by the morbidly curious who added their vehicles to the race into Texas City, while the flight of hundreds of pitiful refugees in cars and on foot increased the confusion.

It was not long before stocks of supplies at clinics became pitifully low and still thousands had not received treatment. Radios begged for medical supplies and hurried plans were made to direct all incoming vehicles bearing such necessities to a central location, where a first-aid station was set up. Organizations that had anticipated the needs, soon began to arrive. This phase of the emergency was met with an amazing degree of precision. As doctors, nurses, and first-aid personnel arrived, they were dispatched to posts of greatest advantage, even into the twisted mass of wreckage that was Monsanto and the Terminal properties to aid the many hundreds who could not help themselves.

As the doctors and nurses organized, so did all government agencies; to control the tremendous amount of traffic that was converging upon Texas City; to keep arteries clear for the run of ambulances that were to make the next thirty-six hours hideous reminders of disaster with their wailing sirens; to furnish means of communication between the dock area, the city hall and road blocks with their car radios; and finally to prevent looting.

Rescue teams were formed which immediately braved the dangers of fire and collapse of wrecked buildings to search for victims. Someone used a bulldozer to strip an area near the docks where the dead and injured could be taken to await transportation, but it soon became apparent that this would not be adequate or safe as rumors began to spread that another explosion was expected. This sped the rescue and removal of injured, for aid to the living was much more important than moving those man could no longer help. Every type vehicle available was pressed into service shuttling from the docks to the auditorium and return as fast as traffic conditions permitted. Likewise, ambulances flowed in seemingly endless caravans between Texas City and all surrounding cities that had available hospital room.

Air traffic also became a problem, for in an hour after the explosion planes were already circling Texas City's little turf airport. Men with the required experience moved a radio-equipped truck to the field to serve as a control tower. In the few feverish days that followed, four thousand landings and takeoffs were negotiated without accident. Planes brought in doctors, nurses, technicians, and morticians, aside from tons of supplies and then carried out wounded who required hospitalization.

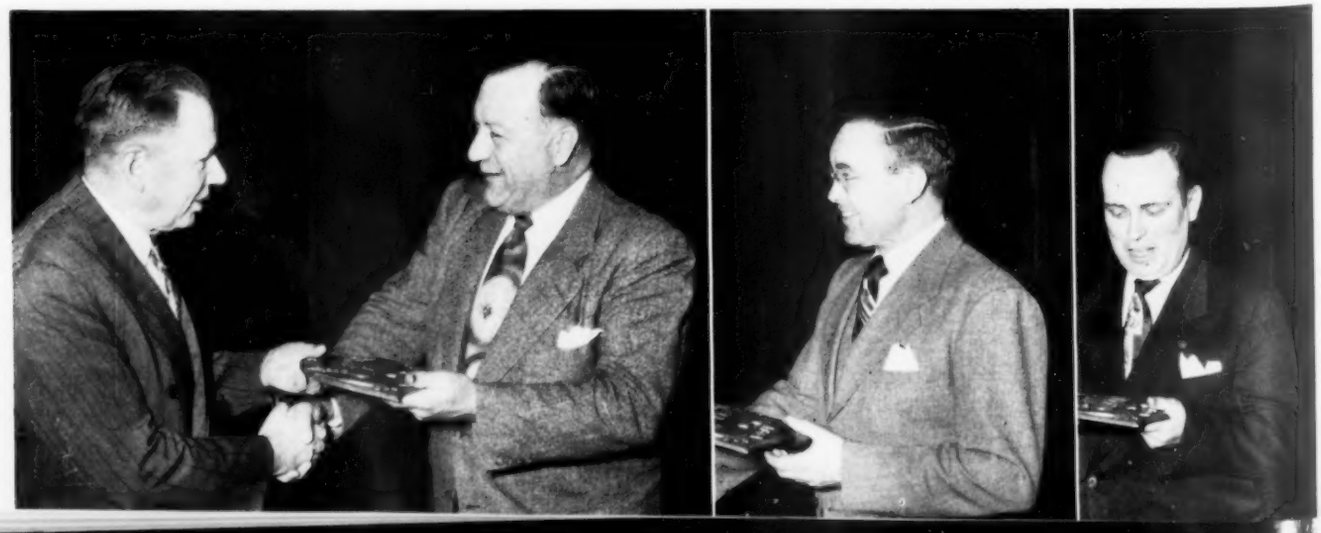
I have mentioned fire trucks with both trained and volunteer personnel which roared into the area beginning within minutes of the blast that was heard for one hundred miles. They responded with an eagerness that had to be restrained until a survey of fires and available sources of water could be made and safe plans of attack could be arranged.

You now have but a vague picture of the traffic problem and with it came the need for food and drink for workers and refugees alike. Relief agencies stepped in and did a magnificent job at stations scattered from the waterfront throughout the city.

Night was approaching and thousands were seeking shelter from further devastation that was almost certain to come. Homes in the surrounding territory were filled to overflowing; churches and schools were opened for refugees; and later Camp Wallace and the Hitchcock Naval Air Station, both vacant at the time, became temporary homes for hundreds.

As darkness came, the rescue teams labored on in the hellish glow of fires and in the stabbing beams of searchlights. But fear was mounting in every mind. The explosion of the *Grandcamp* had torn the *SS Highflyer* loose from her moorings where she had been loading cargo while her main turbines were under repair. This ship was afire and in drifting, had fouled another, the *SS Wilson B. Keene*. Tugs tried to move her to the outer channel but try as they might, she remained fast and at one o'clock the next morning, while orange fire spouted from her holds where 960 tons of ammonium nitrate and two thousand tons of bulk sulphur burned like a volcano, all hands were ordered to abandon the area. At 1:10 a.m., April 17th, the *Highflyer* disintegrated, blasting the *Wil-*

The plaque awarded for distinguished service to the Armed Forces Chemical Association is presented by President Walter E. Lawson to Lt. Col E. E. Fredericks, Chicago Chemical Procurement District; Mr. Lewis Terry, Corn Products Refining Company, Argo, Illinois; and to Mr. Charles Glennon, Chicago Chemical Procurement District. The cover picture shows the presentation of a plaque to Mr. G. M. Glidden, Acme Protection Products Co., Chicago, Illinois. Mr. Glidden is the President of the Chicago Chapter, AFCA. These presentations were made on February 15th, during the Internal Industrial Security Symposium. Not shown in this composite picture, but also receiving a plaque, was Major George E. McElroy of the Chicago Procurement District.



son B. Keene to wreckage and destroying a hitherto undamaged reinforced concrete warehouse and a concrete silo-type grain elevator. It has been said that this was the most violent of the series of explosions. Possibly it was, since later experiments have shown that ammonium nitrate contaminated with sulphur becomes a dangerous explosive. This blast threw an 8,000-pound steam turbine into the Republic refinery, 4,000 feet away from the waterfront. I saw this explosion and it looked like pictures I had seen of exploding white phosphorous bombs as white hot metal filled the sky. Simultaneously, oil tanks outside of the previously affected area exploded and fires raged anew as thousands upon thousands of barrels of oil flashed toward the heavens.

Men who fled at the warning, returned and resumed their task of searching for injured, mindful of but one thing; rescue efforts must go on so long as strength remained. This work continued throughout the night even as tank after tank rumbled into burning fury.

Daylight brought the problem of gathering and caring for the dead, as hope had been abandoned of finding any more living in the steel and rubble.

It was now early Thursday, April 17th, and aside from extinguishment of a few small fires on the perimeter of the burning area, nothing had been done toward controlling the great fires that raged in tank farms affected by the *Highflyer* blast of early morning.

A fire control committee composed of oil company executive and fire experts was formed and headquarters was established on the school football field. Here was assembled every conceivable type of mobile apparatus, including huge oil well cement pumpers, gilt decorated city pumpers, and the home-built pumper trucks of small volunteer companies. There were thousands of pounds of chemical foam powder, truck loads of hose, and a variety of smaller but necessary pieces of equipment.

Experienced fire fighters and volunteers were eager to enter the fight, making no attempt to conceal their impatience while plans were being prepared.

On a table in the tent headquarters, blueprints were spread of underground piping systems formerly designed to handle oil, water, or gas.

The tanks which were burning were marked on the prints and roadways were carefully checked with crew captains. Some apparatus had been taken to prearranged locations and hose lines had been laid. The go-ahead signal was about to be given when a tank of crude oil boiled over and spread fire into areas that had been clear.

A boil-over of one burning tank, signaled the defeat of fire-fighters with a seething roaring column of rolling blaze two or three hundred feet in diameter and a thousand feet high, spreading in a huge umbrella that threatens to settle over a quarter mile circle.

This initial boil-over was also an indication that more were due to occur as this is a characteristic of burning crude oil that can almost be timed if tank levels are known.

Officials of one oil company whose tanks were burning, communicated with the committee and stated that to attempt extinguishment of tank fires in their farm would risk too many lives so with the order "let them burn out," defeat was conceded. Men and machines were withdrawn to stand by in case a shift of wind might endanger the rest of the city.

This, however, does not mean that all-fire fighting stopped. In the Monsanto plant and in wrecked warehouses, fires raged while it was realized that many dead and probably some living were still buried in the wreckage. Pumpers pushed through and drafted water from the Bay and by Friday night the principal fires in Monsanto were extinguished while fires in the warehouses were burning out. Saturday and Sunday the fire-fighting continued. Monday, April 21st, saw the fire in the Humble Company's tank farm under control and on April 22nd, the last of the Monsanto fire was out. Suddenly, an orange plume of smoke started rising from the wreckage of the warehouse from which the *Grandcamp* had been loading cargo a week earlier. This meant ammonium nitrate was involved again and a new wave of fear swept the city. But this time there was no order to keep water away and powerful streams from hose lines soon washed the stuff into the slip.

During the period of fire-fighting, the rescue teams worked incessantly but their burdens had changed as progress was made into fire swept areas. They now carried out pititfully charred chunks that were identified as human remains by keys, pocket knives, and bits of melted silver coins lying with them. The last body to be found was recovered on May 11th—twenty-six days of heartbreaking search.

Texas City had received a mortal wound and many turned their backs and fled, never to return; yet there were those who had the faith of the founders and believed that a city would rise again from the scene of destruction. The courage of these was elevated by the announcements of industrialists who stated, "We will repair and rebuild and expand into a greater city; Texas City will live!"

Today, Texas City has a population of 22,000; hundreds of new homes and dozens of new business blocks have been erected and again it can boast of four operating oil refineries, three chemical plants, the tin smelter, sea-train, and Terminal Railway. It is anxiously awaiting the reconstruction of complete harbor facilities.

In 1947, disaster plans and organization developed after the fact. It is not so today.

Soon after resumption of full production following the blast, my company (and I am certain some others did likewise) instituted what was called a flying missiles survey which incorporated a most comprehensive and pessimistic report of possible consequences from explosions which might originate either within the refinery or from sources outside of the plant. Plans of control were made in case supposition ever became reality.

Texas City industry as a whole has organized a Mutual Aid System designed to function in any emergency that over-taxes individual plant control facilities. Codes are employed to: first, activate traffic control and communication systems; and, second, to request fire-fighting equipment or medical aid either separately or together as conditions demand. To offset difficulties encountered in trying to plan fire fighting methods, as described earlier in the discussion, each industry now maintains up-to-date maps of fire lines to facilitate interconnection or pumping water into or out of individual systems, as the case may require.

The entire city is divided into zones; roadblock locations and detour routes are specified so that, in case of necessity, little delay in traffic control will result. Key personnel of all industries have been furnished with identification which will permit them to pass police road-blocks with or without work groups not so identified.

Complete lists of available fire-fighting equipment are maintained and distributed to all members, as are lists of names and telephones of plant executives who are authorized to either request or release this equipment.

The medical organization maintains lists and locations of all local stocks of emergency supplies and has developed plans for treatment of victims at the site or in a treatment center. Their plans also include the control and dispatching of all ambulances that may be required to enter the city.

This Mutual Aid System is well integrated with organi-

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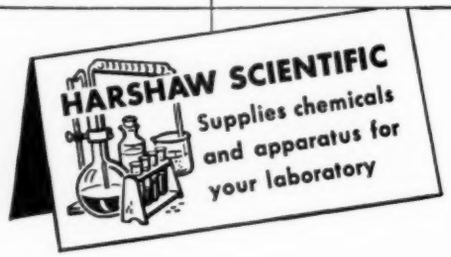

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zations that will function during the time of common catastrophe, such as Gulf Coast hurricanes.

We believe that we are prepared, but we sincerely pray that it never becomes necessary to gear our activities to any thing resembling Texas City, in April, 1947.

A DOCTOR'S VIEW OF AN ATOMIC ATTACK

By AUSTIN M. BRUES, M.D.[1]
Argonne National Laboratory Chicago, Illinois

The phenomenology of various types of atomic attack have been very completely described in a recent government publication,[2] to which the reader is referred for a detailed account of the effects which may be expected from this weapon.

Much popular emphasis has naturally been placed on the effects of radiation from the atomic bomb. The great bulk of the damage and of the human injuries are, however, due to the blast and the heat. In the Hiroshima and Nagasaki areas, between ten and twenty per cent of the fatalities were estimated as being due primarily to the effects of radiation on the human body. The blast wave travels somewhat faster than the speed of sound, but nevertheless takes several seconds to reach the limits of its effective area. An individual standing within the effective area would first experience a flash of light and radiant heat. A significant portion of the radiation dose is not received until after one or two seconds have elapsed. Anyone who can place himself very quickly behind a heavy barrier will, therefore, receive some protection.

The radiant heat emitted by the exploding bomb will be sufficient to start fires over a considerable area. Thus, rescue and repair work will follow lines similar to those after heavy bombing of the "conventional" type, combined with incendiaries. The most important difference is that an atomic bomb causes damage simultaneously over a large area. This will make communications and access much more difficult than in the conventional situation where the bombed-out area will be more inaccessible and rescue and repair operations will be hampered to a greater degree.

When an air burst is used, the radiations will be an important factor only within the radius of most severe blast damage. Preparation for the medical care of the victims of radiation will actually be quite similar to that for large-scale injuries from blast and fire. Attention to general hygiene, replacement of lost blood or body fluids, and use of the antibiotic agents against bacterial infection form the main basis of the treatment of radiation casualties. It is likely that a considerable proportion of the Japanese casualties from radiation might have survived if these measures had been readily available. The possibility of other, more specific means of treating radiation sickness is under vigorous investigation in several centers.

The problem of residual radioactivity would exist and be a considerable one in the event of an underwater blast, especially with an offshore wind. Enough radioactivity, in the form of trapped fission products and neutron-induced radioelements, might be blown over adjacent land areas to necessitate careful monitoring of its amount as a part of evacuation aid repair work, and could entail a difficult problem in decontamination. A bomb set off at ground level would also result in decontamination problems, but probably would not damage nearly so large an area as a high burst.

It must be remembered that residual radioactivity, consisting of a mixture of radioelements, decays according to

[1] Director, Division of Biological and Medical Research; and Associate Professor of Medicine, University of Chicago.
[2] "The Effects of Atomic Weapons," U. S. Government Printing Office, June, 1950.

a fairly well-defined logarithmic function of time; so that calculations can be made, based on the intensity of radiation at a given point at any time after the explosion predicting radiation intensities over the future course of time. For example, every time the interval after the explosion is doubled, the radiation intensity of residual fission products is estimated to become reduced by a factor of a little more than two. As a result of radiation monitoring, one will not merely learn whether a given area is safe to be in, but rather how long one may safely stay in it before returning to an uncontaminated area.

In preparing an industrial area for an atomic attack, attention must be given to assessing the vulnerability of various structures, establishment of rescue teams and suitable emergency shelters, and particularly such information and planning as will foster a feeling of security. This is very important, since in areas of limited damage panic would be the most serious factor delaying recovery.

ORGANIZING PLANT SECURITY

By TYRONE GILLESPIE

Dow Chemical Co., Midland, Michigan

The first prerequisite in planning a security program is *full* support of management.

Next, it is necesary for those of us in security to keep an open imaginative and inquiring mind. We must thirst after knowledge for new protective methods and devices.

Now I want to present 16 points which are vital in setting up a security program.

1. Require application forms which give complete background information.

2. Thorough pre-hiring investigation.

3. Your employment interviews and employment practices should carefully scan the hiring of janitors and charwomen for they work at times when no one else is in the building and they have keys to all of the offices.

4. Proper coordination with your union on subversive matters.

Lt. Col. Tyrone Gillespie
Security Officer, Legal Division
Dow Chemical Company
Midland, Michigan

5. Keep files on suspicious persons showing meetings at "peace rallies," the papers and literature he may read, and other matter showing leftist leanings. Enlist the man's supervisor to help on this project, but WARNING — don't include union activities in this file or you are in trouble.

6. Warn all persons about answering mail and telephone requests asking for information which has to do with productive capacity or end uses where they may be military.

7. Be careful with your public relations to make certain that pictures or factual information of use to the enemy is not revealed. Dow never allows aerial photos.

8. Investigate all picture taking, get numbers on low flying aeroplanes and investigate. Restrict picture taking to your own cameramen.

9. Have rigid control of visitors and car permits.

10. Indentify truckers and delivery people and know what they are carrying when they enter the plant.

11. Investigate all "accidents." Know their cause. This is job for your safety department.

12. Get assistance from the Armed Forces on document control in handling their classified material. Insist that documents be kept filed and not lying about for general perusal. Destroy wastepaper.

13. Work on employee training in order that employees will help in reporting suspicious persons and packages. In this connection there is a good film "Guarding Against Sabotage" that is interesting and helpful in conditioning employees. I have given the information to the Secretary of your Association as to how to procure it. The campaign should be constantly carried on to reduce careless talk with chance acquaintances.

14. Know the subversive situation in your area.

15. Coordinate with local police agencies, but be careful with whom you deal.

16. Obtain services of a group of specialists in security and plant protection if you have no background. Such a service is offered by Counterattack magazine, 55 West 42nd St., New York City.

The above are security measures in addition to your usual plant protection functions which can be obtained in detail from publications which are listed in the Symposium program.

Now as my last set of suggestions, I would like to briefly review some of the matters which we feel you should think upon and plan for the training of your protective forces—your guards and employees.

There are three major headings which are fire, police, and safety. Each guard should be trained in all three.

Now as to specific subjects of police training.

1. Organization for the guard force. Setting forth the duties of each guard and officer.
2. Plant geography.
    1. Areas adjacent to your plant.
    2. Flammable storage.
    3. Hazardous operations.
    4. Surrounding streets and highways.
    5. Location of fire apparatus, water lines, check valves, switches.
    6. Bridges, gates, tunnels and shelter for potential saboteurs.

These are but a few of the studies that should be made.

3. Guarding and patrolling.
    1. System of handling gates.
    2. Badges and credentials used by the company.
    3. Tool control.
    4. Visitor and car control.
    5. Clock routes—staggering the routes to avoid regularity of checking.
    6. Communication with headquarters.
    7. Special checks of safes, tool rooms, blueprint rooms, valuable material storage areas and vital machinery areas.
4. Communications Division.
    1. Communications is control point.
    2. Auxiliary systems and how operated.
    3. System to get messages to persons responsible for disaster control.
    4. Logs required by Federal Communication's Commission.
    5. File of messages.
    6. Do guards generally know how to use communications equipment?
    7. Employees generally know location of emergency telephones.
    8. Reporting emergency without scan or minimizing the problems and properly setting out the factors that should be reported.
    9. Have telephone lines been checked for taps?

5. Traffic Control.
   1. Peak loads study.
   2. Emergency equipment handling and routing.
   3. Proper attitude towards traffic violators.
   4. Techniques for hand signals, flashlights, whistles, and lanterns.
   5. Traffic control at intersections.
   6. Traffic control in outlying areas.
   7. Emergency controls including dispatching of traffic and blocking off streets.
6. Personal Identification.
   1. Obtaining descriptions.
   2. Passes and badges.
   3. Fingerprints.
7. Personnel Selection—with personnel and guards.
   1. Psychologists.
   2. Application forms.
   3. Sources of personnel.
   4. Checking of absentees.
   5. Training on naturalization laws and hiring and use of aliens.
8. Sabotage and Espionage.
   1. Training on sabotage methods and espionage methods.
   2. Zealously guard production figures.
9. Bombs and Explosives.
   1. Proper handling.
   2. Damage control.
10. Gathering of Evidence.
   1. Importance.
   2. Collecting specimens.
   3. Toxicological examination.
   4. Blood stains.
   5. Ballistics.
   6. Fingerprints.
   7. Microscopic and spectroscopic.
11. Industrial Housekeeping.
   1. Plant protection helps safety.
   2. Reduce fire hazards, waste and unsafe practices.
   3. Speed up production.
   4. Locate scraps and dispose of unused equipment.
   5. Friendly competition and planned campaign to increase efficiency.
12. Discipline and Courtesy.
   1. Prompt obedience.
   2. Voice control.
   3. Psychology.
   4. Courtesy.
13. Reports and Report Writing.
   1. Only way of retaining facts.
   2. Types of reports.
   3. Promptness in submission.
   4. Care in writing.
14. Care and Use of Equipment.
   1. Patrol equipment—clocks, lights.
   2. Care of uniforms.
   3. Firearms.
   4. Firearms training.
   5. Training on use of equipment. F.B.I. is good example.
   6. Storage and equipment.
15. Laws and Techniques of Arrest, Searches, Seizure.
   1. Methods of search.
   2. Entry into buildings.
   3. Planned arrest.
   4. Rights of individual.
   5. Rights of officer.

As you can see the duties of a good security and plant protection officer are endless. Good luck and I hope that some of the things I have mentioned will help you in your planning.

UNCOVERING SUBVERSIVES IN YOUR PLANT

By WALTER J. LERCHE

Executive Secretary, Cicero Manufacturers Association, Cicero, Illinois

In the past we have had to deal with a more or less stereotyped sort of subversive—a more nationalistic type that set some methods of behavior pattern. But how can you readily type the present kind of subversive—neither by race, creed, nationality, social or even economic status. That statement in itself seems to resolve the problem for us that we can't write or tell a few easy rules for uncovering this new type "Redman."

The search for an avowed or professional type is not the main problem. Those we can see. It is the sleeper, the dupes, who do or are to do the professionals' bidding that we must seek out; and then if the professional does not have his "army" to do what he wants, then he will be defeated before he starts. If you wonder about the use of the word "army," let me quote a few statements from one of the individuals who studied at the International Lenin University at Moscow. His account of the training follows in brief.

Mr. Walter J. Lerche
Executive Secretary
Cicero Manufacturers Association
Cicero, Illinois

"We studied how to dismantle the weapons of leading countries, that is, their main weapons, such as rifles and machine guns and so on. We studied the details of how to develop street fights, how to do barricade fighting, how to seize control of a city, the most economically and technically strategic points. We were given regular military training. We had target practices, military fights and strategy. Then we were taught what is called partisan warfare, the science of civil warfare, revolutionary uprising. We were taught the conspiratory type of warfare, how it is related to the boring-in process, street fighting, and how to mobilize in blocks, the blocks in a city, the workers in a plant; how to develop a general strike into a city uprising. We were taught to make armies on the basis of the immediate emergency of the moment or whatever the situation may be. We were taught to concentrate on the food supply, the warehouses, the utilities, that is water, light, gas and communications. We were instructed in sabotage, how to wreck trains, close down factories, facilitate discontent and raise the mob spirit in order to get the men on the go." (This is from the Committee on Un-American Activities Reports.)

Mr. J. Edgar Hoover has said, "The party doesn't rely on actual membership for its strength—what is important is the claim of the communists themselves, that for every party member there are ten ready and willing to do the party's work."

What then is our hope to find these duped and frustrated peoples? First we have to realize truly that the problem exists and then educate ourselves about the organization, its members, and methods. That is not easy; even our experts haven't been able to do it overnight. It has taken them considerable study and experience; we who devote our talents to other daily pursuits are not going to do it

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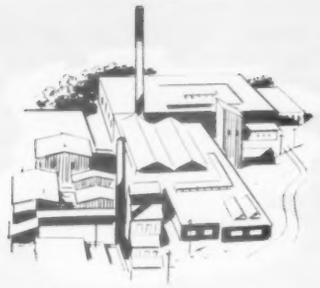

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in a few lessons. Knowledge is power; it is power in that it means consciousness, awareness, and understanding. When each of us understands a subject, we are not prone to unwise hurried action; the uncovering of subversives is a subject in no way an exception to this rule. As we go about this task in a calm and deliberate manner, we should bear in mind that we should never try to be an authority for the determination of whether an individual is a communist or not. That task belongs to the experts. What we can do is to try to be good reporters—not editors.

The more you study about communists, the easier you will find it is to recognize them and do a better job of reporting to the experts. What can be done then to fortify ourselves to this end? I can perhaps best answer this by telling some of the things that have been done in our Cicero industrial community.

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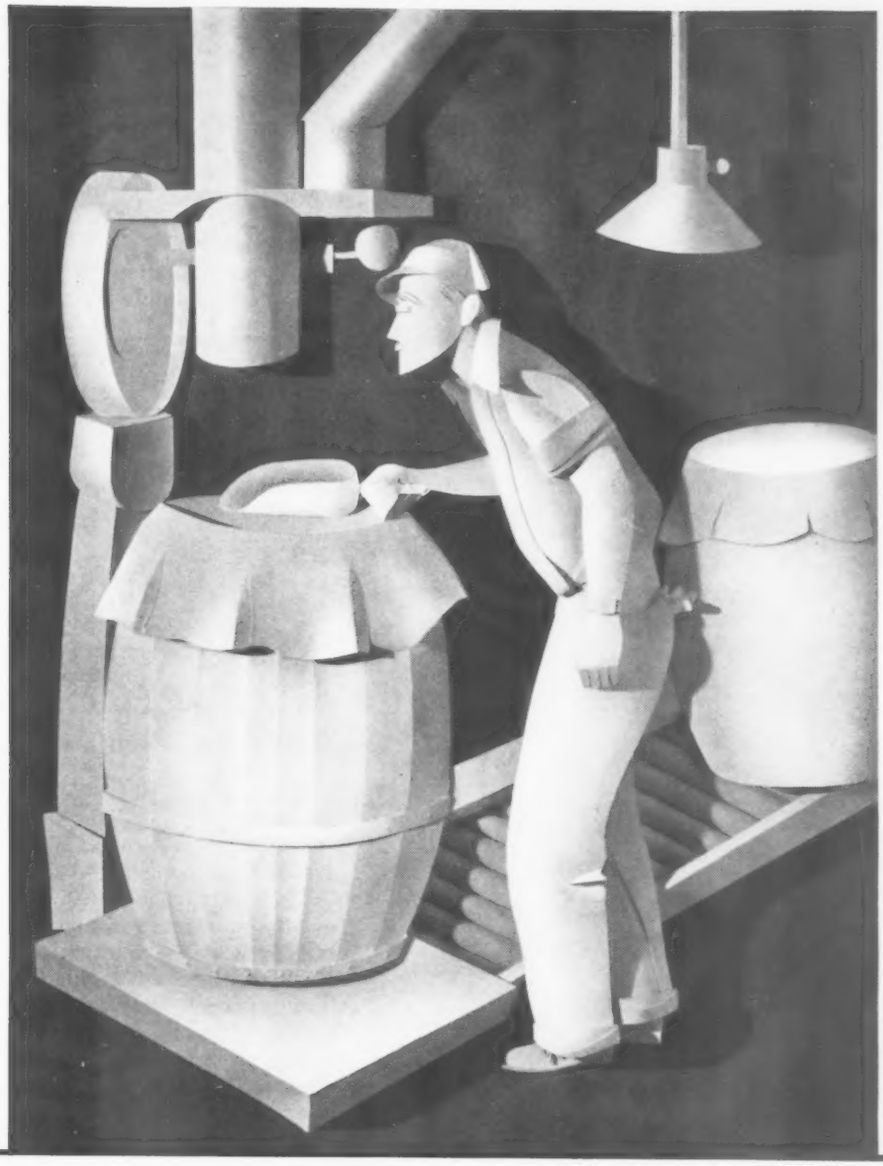

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- NIALK Caustic Potash
- NIALK Carbonate of Potash
- NIALK Paradichlorobenzene
- NIALK Caustic Soda
- NIALK TRICHLORethylene
- NIAGATHAL* (Tetrachloro Phthalic Anhydride)

*Trade-mark

NIAGARA ALKALI COMPANY

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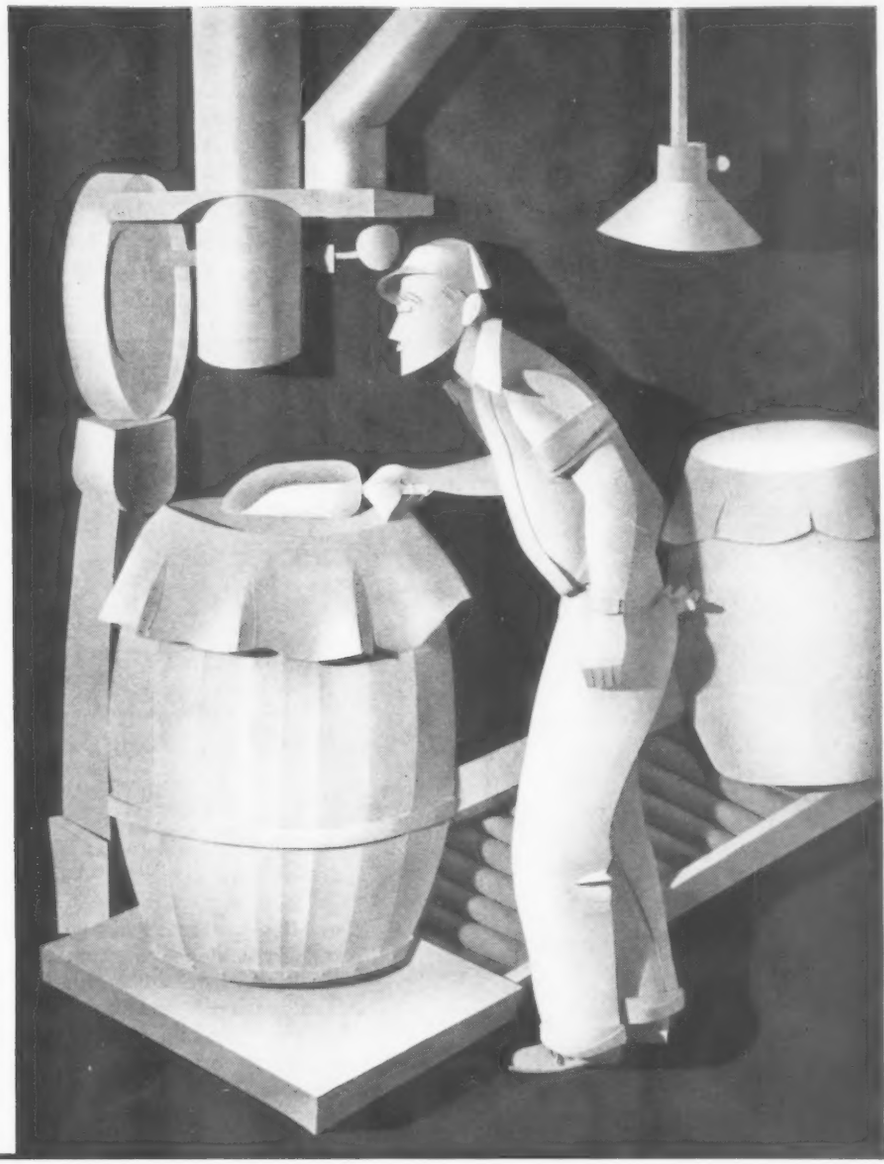

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1. Greet the worker pleasantly with a word of assurance that he will be successful.
2. Have someone show him the little things, i.e., washroom, lunch rooms, drinking fountain, how to get tools, record his time, credit union, first aid, etc.
3. Follow-up with word of encouragement commenting especially on those things he is doing well and offer advice on how he can improve on others.

The Need For Appreciation

Many psychologists believe that the strongest human desire is a craving to be appreciated. A feeling that our efforts are really appreciated is certainly one of the conditions most essential to happiness in the work situation.

The supervisor should take every honest opportunity to commend the work of his employees. Favorable comments need not be confined to things which have occurred in the shop.

Be most careful to see that too large a share of the complimentary comments is not given to just two or three people in the department.

Feelings Should Be Respected

Closely allied to the desire for appreciation is the desire "to be treated like a human being." Nothing should be required of any worker which will detract from his feeling of self-respect; nothing which will prevent him from maintaining that simple, human dignity which everyone desires. Arbitrary orders without explanation, criticism in front of others, rules or practices which seem to imply suspicion of one's honesty—any of these lessens a person's self-respect and builds up resentment.

Security requires strict rules and two simple precautions will prevent resentment. The first is to explain in advance why the rule is essential, and the second is to make the rule as nearly as possible universal in its application.

It is also most important that the supervisor tell each person in advance of any change which will affect him and explain the reason for the change.

Fair and Impartial Treatment

Another condition most important to happiness on the job is the feeling on the part of each worker that his supervisor and the general management will always play fair with him—that criticism, praise, promotion, layoffs, or whatever may come will be handed out on a merit basis only.

Do we sometimes criticize an employee for a mistake when careful inquiry would show that he has not been properly taught.

Do we occasionally make careless comments about a worker's ability, comments which may lead others to form an adverse judgment, when our opinions are not based on thoughtful analysis of facts.

Do we sometimes make promises to employees which we sincerely intend to keep, but neglect to make a follow-up record to be sure those promises are kept.

It should always be remembered, too, that how a man is treated in relation to others in his unit is what counts, not just how he is treated. There is probably no one thing we Americans hate more than partiality.

Correct With Fairness and Consideration

Skillfully and sympathetically done, correction builds character, restores courage and self-confidence, and increases rather than destroys happiness in the work situation.

The supervisor who merely hands out work, prodding the employees now and then for more production, "firing"

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them if they do not make good—that supervisor makes no worthwhile contribution to his organization.

The supervisor who, when he finds people in his department whose attitude is not as it should be, seeks ways to help them correct the faults which are holding them back, and patiently and skillfully leads them out of failure into success—that supervisor has made a real contribution to his firm, to his subordinates, and to society.

Real correction is the highest art of supervision. The supervisor who has mastered it will improve faulty performance by searching for and eliminating the causes rather than by browbeating and threatening. He will build self-confidence and courage rather than fear, and enthusiastic cooperation rather than unwilling compliance.

Pride In the Worthwhileness of Work

A feeling of at least a reasonable degree of pride in the aims, methods and products of the company one works for is certainly a most important, probably an essential, component of morale.

It is said that prisoners required to carry a pile of brick from one side of a prison yard to the other and on alternate days carry them back will go crazy; while, if they were carrying the brick to build some worthwhile structure, they would enjoy the work.

The supervisor can and should play an important role in the process of imparting to each new worker a feeling of pride in the company and the products it puts out.

Work Should Be a Satisfying Experience

Of all the responsibilities a supervisor has, the one we are most likely to overlook in any discussion of his duties is that of making each person as congenial as possible to others in the department so that working will be a satisfying social experience as well as a means of making a living.

Conclusion

The success of Selling Security To Your Employees will be determined by how well supervision is: versed in guiding, developing, and controlling the actions of men and women. But his skill in this field of security must be built on a sound foundation of knowledge—knowledge of his own organization, its objectives and pattern, its policies and methods; knowledge of his task of organizing, deputizing and supervising; knowledge of his duties and responsibilities and their delegation.

Then with this foundation he must understand and apply the basic principles and techniques that have been tried and found successful in managing manpower toward the objective, whether it be production, safety, quality, security or what have you.

THE SEARCH FOR TRUTH

George R. McSwain, Special Agent in Charge of the Federal Bureau of Investigation, addressed the evening session. Mr. McSwain brought to the assembled audience a message of personal greeting from J. Edgar Hoover, Director of the F. B. I., following which he gave a brief synopsis of the growth of the Federal Bureau of Investigation, particularly since 1924 with the appointment of J. Edgar Hoover as Director. He recalled the period of the thirties when the problem of increased crime was a most serious domestic menace to the United States and related the FBI's part in bringing to task the kidnaper, the bank robber and the extortioner by reason of legislation enacted between 1932 and 1934, which provided the means by which the Federal government could enter these fields of investigative pursuit.

George R. McSwain
U. S. Dept. of Justice
Federal Bureau of Investigation

At the time of the national emergency in 1939, a Presidential Directive was issued designating the FBI as the coordinating agency in matters of internal security, and Mr. McSwain related the responsibility of the Federal Bureau of Investigation under this authority, explaining how the FBI together with the intelligence forces of the armed services have been since that time closely knit for the purpose of effecting the internal security of America. He related that during World War II not one case of enemy directed sabotage occurred in the United States. As an example of the investigative activity of the FBI in the field of espionage, he related the details of several interesting cases which described the vigilant watch over the enemies of our country in time of war.

He stressed the importance of each generation's being prepared to accept and discharge its obligations, emphasizing the fact that our priceless heritage had to be won and that it cannot be bequeathed by instrument or document alone. He urged adherence to our system, which is based upon the principle that man is free by reason of a God-given right and stressed the fact that there should be no violations of this inalienable right. He urged that all work for peace and for freedom by searching for the truth, because in truth there is peace and freedom.

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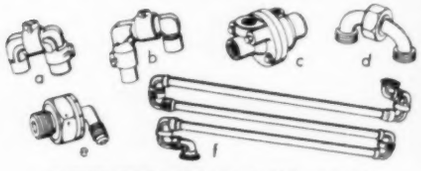

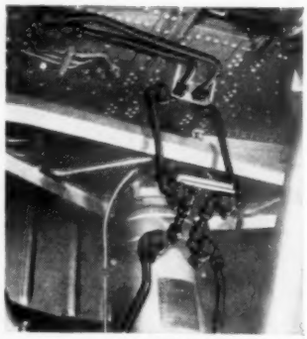

1 Typical CHIKSAN installation on hydraulic lines for aircraft landing gear.

2 Brake line installation on torque link in aircraft brake system.

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CHEMISTS PROMOTED BY HYMAN & COMPANY

Announcement is made by Julius Hyman & Company, manufacturer of Aldrin and Dieldrin, Denver, Colorado, of the promotion of Dr. Rex E. Lidov to the position of Director of Research. Mr. Henry Bluestone, who joined the company in the Spring of 1947 has been named Assistant Director of Research, filling the position which Dr. Lidov has held since the company was organized in 1946. Both men are graduates of the University of Chicago.

CHEMICAL OFFICER INVENTS "BRAIN BANK"

A young Chemical Corps officer has come up with a solution to the problem long faced by biologists and biochemists—that of breaking down living tissue cells without completely destroying them.

Working in the Medical Division laboratories of the Army Chemical Center, Md., Lt. Joey M. Pirrung of Cincinnati, Ohio, has developed a simple high-pressure cytolyzer, which, for want of an easier name, is privately referred to as "the brain bomb" by his fellow workers.

Constructed from salvaged equipment, the cytolyzer consists of a small gas cylinder with an internal pressure rating of 3,000 pounds per square inch and equipped with two 1½-inch sleeves in the sides, giving access to the chamber for placement and removal of samples. At either end of the cylinder are valves, one of which is an old steam safety valve converted to a "quick release" valve.

Samples of living tissue are allowed to remain in the cylinder for 24 hours under high pressure nitrogen. During this time the individual cells are literally filled with gas. When the pressure is suddenly released, the cell wall blows apart similar to a bursting bomb. Using samples of rats' livers and brains, as well as whole flies, scientists at the Chemical Center have found that Lt. Pirrung's invention provides the desired effect in producing material for study.

The usual method of breaking down cells for study has been to grind the tissue in a mortar-and-pestle device called a Potter-Elvejhem homogenizer. This breaks up the cell walls and releases their contents. However, such a process is often unsatisfactory since it generates heat which may destroy or inactivate the enzyme, is unable to handle large quantities, and sometimes fails to break up the cells.

Lt. Pirrung's "brain bomb" overcomes these difficulties. The sudden

pressure drop has a marked cooling—instead of heating—effect, several hundred cubic centimeters of material can be processed at once, and the cell break-up is practically complete in all instanes.

The 24-year-old lieutenant is a graduate of the University of Cincinnati, and, as an enlisted man, served as a laboratory technician in the Army during 1944 and 1945. He was an assistant at the university from 1946 through 1948, and in January, 1949, was ordered to duty as an officer and assigned as a biochemist in the entomology section at the Chemical Center. He was recently given an overseas assignment. Lt. Pirrung is the son of Mrs. Grace Pirrung of 3800 Drake Ave., Cincinnati.

HOWARD V. WRIGHT

Howard V. Wright, Director of the Army Chemical Center Chapter, Armed Forces Chemical Association, died on Nov. 21, 1950 in Union Memorial Hospital, Baltimore, after a lengthy illness.

Mr. Wright, outstanding Engineer and Civic Leader, was born in Indianola, Iowa, June 4, 1892. He received his A.B. from Simpson College, Iowa, in 1917 and upon graduation was employed as a chemical engineer at the Iowa Engineering Experiment Station. He was a member of Alpha Tau Omega, Phi Kappa Phi, and Phi Lambda Upsilon fraternities. He enlisted in the Engineering Corps in 1918 and was mustered out in 1919.

Mr. Wright continued his professional development after the war as an instructor in chemical engineering at Iowa State College and received his M.S. in 1921. He served as Assistant Professor of Chemical Engineering at Iowa State College until 1925, when he came to Maryland to enter government service.

At Edgewood Arsenal, Maryland, Mr. Wright became Assistant Chief and finally Chief of the Chemical Plants Department, in which capacity he served until 1932. He was Chief of the Munitions Division until 1938 and finally became Chief, Plants Division of the Technical Command. As Chief of this division, he supervised the development of all pilot-plant activities at Edgewood. He served in this capacity until his death.

In addition to being an outstanding chemical engineer, Mr. Wright was a Rotarian, Past Commander of the Edgewood Post, American Legion, an avid sportsman, and gladiolus grower extraordinaire.

Considered one of the finest amateur horticulturists in the country, Mr. Wright annually grew thousands of gladiolus at his home in Bel Air, Maryland. He had developed new varieties of gladiolus, one of which is considered one of the ten best varieties and has won ribbons in all shows he exhibited. He was one of the founders and first president of the North American Gladiolus Council, an organization which grew from a modest beginning to become the largest of its kind with members in many foreign countries. He also served as Editor of the North American Gladiolus Council Bulletin, a quarterly publication.

Mr. Wright was one of the charter members of the Armed Forces Chemical Association and at various times was an officer of the Army Chemical Center Chapter.

Surviving Mr. Wright are his widow, Mrs. Mildred Wright of Bel Air, and one son, Major Ernest C. Wright, currently in charge of the Army Chemical Laboratory, Hanau, Germany.

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BIOLOGICAL WARFARE

(Continued from Page 9)

ment. Every clue would count. A prompt report might lead to the prevention of many cases of illness, and even prevent deaths.

In times of emergency, you must inform your doctor of any strange or unusual sickness that might break out in the family. If the food or drinking water in your office building or factory should make you ill, be sure to report the fact at once to your supervisor.

If chickens or cattle get sick, farmers should call in a veterinarian. Should they notice anything really out of the ordinary in garden plants or field crops, they should notify the county farm agent, or phone the nearest civil defense office. All reports of serious crop failures and diseases should be investigated by plant experts.

Don't get excited over this, but never fail to act promptly. Time could be all-important should there ever be a germ attack. Farmers should start keeping a close watch right away.

WHAT WOULD HAPPEN AFTER A BW ATTACK WAS SPOTTED?

VACCINATIONS MIGHT BE REQUIRED TO COUNTER SOME BW ATTACKS
EMERGENCY REGULATIONS MUST BE CLOSELY FOLLOWED IF THEY EVER BECOME NECESSARY
OCCASIONALLY THE DESTRUCTION OF LIVESTOCK AND FIELD CROPS MIGHT BE NECESSARY

Once a BW attack had been spotted and classified, the civil defense authorities would move promptly to help those suffering from its effects and to prevent spread to other people and areas.

Vaccinations and shots would protect us and our livestock from many different kinds of diseases. Still, there are some sicknesses for which we do not yet have sure-fire preventives or cures. Sometimes special measures might have to be taken to counter the effects of a raid.

If a BW attack should create a serious outbreak of some highly contagious, or very "catching" disease, it would be necessary to place a strict quarantine on certain areas.

Where livestock or food crops were hit, all outgoing shipments of animals, meats, or other farm produce might have to be barred for a time. You and everyone else must abide by regulations of this kind. A single violation of the rules might lead to a second or third outbreak at other points.

Once the effects of a BW raid were brought under control, it usually wouldn't be too hard to stamp them out completely. But there might be exceptions. Throughout the world, there are many highly destructive plant and animal diseases for which no practical controls are yet known. Should an enemy spread certain of these diseases among our livestock or field crops, extreme emergency measures might have to be applied promptly.

Foot-and-mouth disease is an example. At great effort and expense, foot-and-mouth disease has been brought under control in the United States. But should it attack our cattle again, we know there is only one sure course of action. All infected animals must be promptly destroyed. In the same way, the outbreak of certain plant plagues might call for the use of poisons or fire to destroy the stricken crops. These are harsh measures, but all personal losses suffered in this way must be measured against the over-all damage to the Nation which could come from failure to stop fast-spreading diseases at the very start.

WHAT OTHER STEPS SHOULD BE TAKEN TO COUNTER BW?

EVERYONE MUST TAKE ADVANCE STEPS TO COUNTER BW ATTACKS
NEIGHBORHOOD AND PERSONAL HEALTH ARE IMPORTANT
STRICT PUBLIC HEALTH RULES ARE REQUIRED FOR CITIES
PEOPLE LIVING IN THE COUNTRY MUST HELP TOO
PERSONAL HEALTH IS LARGELY A MATTER OF COMMON SENSE

While our civil defense and health authorities would carry the biggest part of the load in defending us against BW, that would not be enough. They would need the very important help that only you and your neighbors could give.

In times of emergency, and particularly in the event of all-out war, neighborhood and personal health measures would be of extreme importance. We must do all we can to make it hard for disease to spread.

City dwellers must step up their efforts to get rid of rats and other disease-carrying vermin. Garbage and similar refuse must be placed in covered containers and properly disposed of very often. Sometimes it might be necessary to close public swimming pools and to bar certain types of public gatherings, just as we do when natural epidemics strike.

People living in the country must take similar precautions. Barns and other outbuildings must be kept extra clean. Garbage and dead birds and animals must be promptly burned or buried. Vermin must be kept under control. Poultry, cattle, and field crops must be closely watched for the first signs of disease.

Personal health is largely a matter of common sense. Keep your home and yourself clean. Wash your hands before handling foodstuffs or eating your meals. Try not to get overtired or rundown; that lays you open to illnesses of all kinds.

Remember, vaccinations and inoculations will provide protection against some kinds of biological agents. If your local civil defense health authorities ever ask you to report for vaccination or a "shot," do it.

If you don't work with your authorities, you might endanger not only yourself but your family and neighbors as well. If similar steps are suggested for your poultry or livestock, by all means accept them. Never forget that neglect on the part of a few people may work serious hardship on many others.

WOULD THERE BE ADVANCE WARNING OF BW ATTACKS?

ALWAYS SEEK SHELTER WHEN AN ALARM SOUNDS
IF POSSIBLE, STAY INSIDE UNTIL THE ALL-CLEAR IS SOUNDED

You wouldn't always have advance warning of biological attacks. Even when an alarm sounded, you usually would have no way of knowing just what was coming. It might be atomic bombs, high explosives, poison gas or germs. It could be several of them at the same time.

But there is one thing you must do in any raid which might come: Always get inside a building or shelter or some other protected spot, if you can. Even in such places there would be no absolute guarantee that you would be unharmed, but you would be much safer than out in the open.

If you do get inside some sheltered place, you should not be in a hurry to leave it unless you have civil-defense

duties to perform. Fire or some other emergency may drive you out, of course. Otherwise, stay inside until the all-clear signal is given, or until you get word that it is safe to go outside. This is true of all kinds of raids.

WHAT PRECAUTIONS SHOULD BE TAKEN AFTER A RAID?

TO CAUSE SICKNESS, GERMS AND TOXINS MUST GET INSIDE THE BODY
SOME SIMPLE MEASURES ARE VERY EFFECTIVE AGAINST BW
GERMS AND TOXINS CAN BE REMOVED BY UNDRESSING AND WASHING
ALL POLLUTED CLOTHING MUST BE CAREFULLY LAUNDERED OR AIRED
FOOD AND WATER MUST BE CHOSEN WITH CARE
CANNED AND BOTTLED GOODS ARE SAFE
SOMETIMES FOOD AND WATER MAY HAVE TO BE BOILED

Germs and toxins can cause sickness only if they get inside your body. Usually they get in through your nose or mouth. Sometimes they may enter through open cuts and wounds. Only a very few kinds of germs and poisons can work their way in through unbroken skin.

A completely air-tight face mask and suit covering your whole body would provide complete protection from BW. But even if we all had outfits of this type, we could never hope to go about our daily business while wearing them. We must rely on simpler things for our safety. Luckily, many of them are quite effective.

If we keep well-covered, most of the germs or toxins we accidently might pick up would become lodged on our clothes rather than on our bodies. Then by taking off the clothing, we could get rid of most of them.

Those that were left usually could be removed thoroughly by washing our faces and hands, but it would be safer to take a bath or shower, if possible. By taking those steps promptly, we usually could get rid of germs and poisons before they had a chance to get inside our bodies where they might cause trouble.

Naturally, all washable garments polluted with germs should be scrubbed clean before they were worn again. Boiling, plus a good soaping, usually would make them perfectly safe. But don't forget that tubs and washers used for this purpose also should be thoroughly cleaned after use, to prevent possible pollution of things later washed in them.

Woolen clothes, shoes and other things which won't stand washing or boiling could be at least partly freed of germs by hanging them in the sun and air. Dry cleaning would be very good.

You should always be careful what you eat and drink after any kind of a war attack. If civil defense authorities say a BW attack has been made, you should be doubly careful. One of the easiest ways to get germs and toxins inside your body would be to take them in accidentally, along with food and water. Don't forget that food and water are the natural homes of many disease producers. A few germs that get into food might grow into millions inside a very short time.

Provided the containers were unbroken, canned and bottled goods would be perfectly safe to use following attacks of all kinds, including atomic bombings. But, whenever possible, the containers should be thoroughly scrubbed before being opened. That would remove practically all germs, poisons or radioactive dusts that might be lodged on their outsides.

Packaged foods, as well as those kept in refrigerators and closed cupboards, would not likely become polluted. However, to play safe, it sometimes might be necessary to boil everything except canned and bottled stuff for 10 minutes before eating or drinking. Boiling will kill most germs and destroy many plant and animal poisons, but it will not remove radioactivity.

HOW LONG WILL GERMS AND TOXINS LINGER AFTER A RAID?

GERMS AND TOXINC USUALLY ARE NOT DANGEROUS FOR VERY LONG
OCCASIONALLY LINGERING GERMS MAY HAVE TO BE CLEANED UP
DECONTAMINATION IS A JOB FOR TRAINED WORKERS

When scattered about in a raid, most germs and toxins would be likely to settle in places where they could not live or stay dangerous for very long. As a rule, heat and cold, wetting and drying, and particularly exposure to sunlight, will destroy germs and plant and animal poisons within a short time. But there might be exceptions.

Some few kinds of germs are very hardy. They wrap themselves up in a sort of capsule and remain dormant, or inactive, when conditions are unfavorable. Then, as soon as things turn favorable again, they come out of their protective shells and start to multiply. If germs of this kind were present, or if large numbers of other kinds were found, it might be necessary to clean up, or decontaminate, the places where they were found.

In most cases, decontamination would be a job for specially trained and equipped members of the civil defense health services. The detection crews might find that some particular place was dangerously polluted. All people would then have to get out of that place and stay out until it was decontaminated and declared safe for use again.

TO SUM UP, WHAT ARE THE KEYS TO EFFECTIVE BW DEFENSE?

BW ATTACKS CAN BE COUNTERED
EVERY CITIZEN MUST HELP TO BACK UP THE HEALTH SERVICES
YOU MUST STRIVE TO KEEP GERMS AND TOXINS OUTSIDE YOUR BODY

To protect yourself from BW attacks, remember these facts:

Biological warfare is simply a special kind of attack. It could be used against people, livestock or food crops, but it could not wipe out a whole nation, or even a city. If everybody knows the facts and if we all work together, we can meet any BW attack.

(Continued on Page 56)

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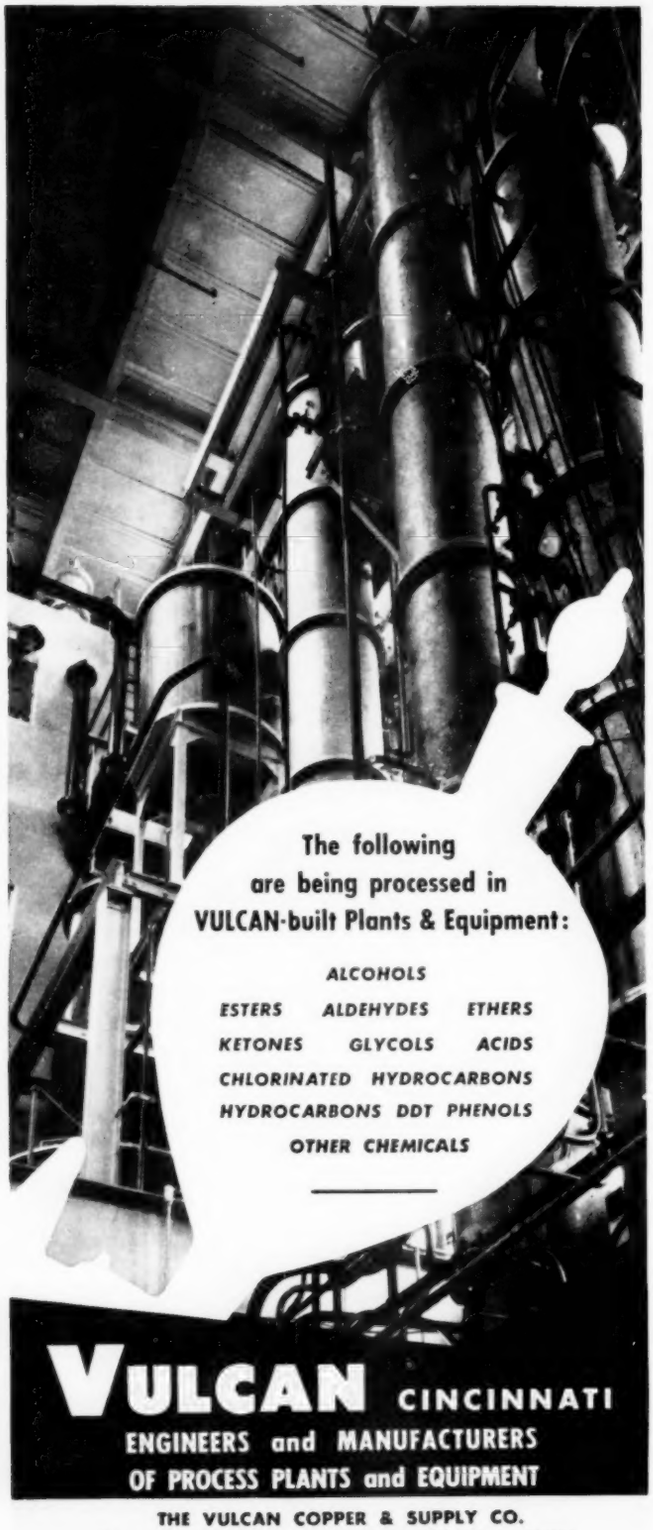

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GAS WARFARE

(Continued from Page 3)

I would by no means argue against our policy of non-aggressiveness; this would be an argument against our American way of life as we hope to live it. I do believe that if we are to continue to grant our enemies the tremendous advantage of selecting the time and the place we must fight, we must, for the sake of our lives, do everything within our power to retain the right to select the weapons.

Our potential is not in a great standing armed force, nor even, when compared with Russia, in a great land mass to serve as a buffer against possible attack. Our potential is in our productive capacity and our knowledge of how to quickly turn it to war. It is my firm belief that if we are attacked, or if it is obvious that we are in danger of attack, our attacker is asking for everything we can throw at him. He should get it.

If war comes again, or perhaps better when war comes again, our choice of weapons should be dictated by two considerations only: military effectiveness and our productive capacity as compared to that of our enemy. If we can produce more toxic gases and biological agents than can our enemy, and competent military authority decides that these agents are a useful weapon, it would be stupidity not to use them.

WM. W. TAGGART

CHEMICAL AND ENGINEERING NEWS

Washington, D. C.

Thank you for your note of February 12 suggesting that I comment on the editorial appearing in the January issue of the ARMED FORCES CHEMICAL JOURNAL.

Anything I might say in this connection is a personal opinion and in no way reflects the official position of the Society or the Society's publications.

In the dim past there was some degree of chivalry exhibited in war. Generally speaking, action was limited to the military or naval forces. This is no longer true. War today is total war and pits the complete resources of one combatant against the other. Under these circumstances I see no particular moral difference in the use of one weapon as against another. It would appear to me that the major consideration is the specific efficiency in creating death and destruction and the temporary crippling of an enemy. All this may be horrible to contemplate, but if fight we must, we must realize that it is literally a struggle for survival.

Therefore, I can see no good reason why chemical warfare agents should not be used if and when the military feel that advantages over an enemy can be gained by such employment. There is another factor that I do not think has been given full consideration. Today the American taxpayer is being levied to meet the costs of reviving our former enemies—Japan and Germany. How much less expensive it would be if a quick knockout of our enemies had been possible through the use of chemical agents that might temporarily incapacitate the military opposition.

WALTER J. MURPHY, *Editor*

Boston, Mass.

I approve of the editorial written by Col. Rodier, as a good start toward the conclusion reached at the Chicago Directors meeting. I think that the problem lies much further, however, than merely an editorial in the JOURNAL, unless such an article would have sufficient appeal to be copied by periodicals—possibly the editorial page of a newspaper—with much wider circulation. Most of our members, or they wouldn't be members, are in sympathy with the sense of the editorial.

CHENERY SALMON, *Lt. Col.*, CmlC USAR,
President, Boston Chapter

NATIONAL RESEARCH COUNCIL

Washington, D. C.

As you probably know, there have been previous, unsuccessful attempts made to reverse the existing policy of the United States to use chemical warfare in retaliation and only after it has been initiated by the enemy against us. Lt. Col. Rodier, editor of the ARMED FORCES CHEMICAL JOURNAL, has presented the salient points indicating the fallacy of this policy. I believe the American public will quickly grasp the weakness of our position when the facts are called to their attention. I further believe reversal of this policy may be another deterring factor to initiation of open war by our potential enemies since it will clearly indicate to them that the United States is prepared to use *any* or *all* of its developed weapons at any time that the situation warrants their use. The decision regarding the use of any specific weapon by United States troops should certainly be made by us and not by our enemies.

W. R. KIRNER, *Director*,
Chemical-Biological Coordination Center
National Research Council

ARTHUR D. LITTLE, INC.

Cambridge, Mass.

First, let me say that I am very glad to see the Association assume the leadership in a program which in the end is directed at educating the American public on an important sector of our defense program. As I stated at the meeting in Chicago, this is greatly needed and unless the American public is correctly informed on this important subject, our military leaders may be greatly handicapped, and unnecessarily so, in some future operation.

I find myself in agreement with the Rodier editorial and, in fact, I think it an excellent opener for the whole subject. My only adverse comment regards the concluding sentences of the third paragraph on page 2. I think the presentation is somewhat weakened by arguing a point which might better be left with a statement of fact. Also, the argument is a little vague and tenuous to me.

However, I find myself not in agreement with Ed Baker's proposition and I would question the advisability of the Association coming out so definitely in support of a proposal which is probably very questionable from the military point of view at this time. He has presented only the pros and not the cons. I do not question but that we could have used gas in Korea with a very telling effect but at an unknown price. It is well known that the Soviets are prepared to wage chemical warfare and it seems a fair assumption that they could provide the Chinese troops with the means for a retaliation in kind.

EARL P. STEVENSON

I heartily agree with both. Our enemies now control or may eventually control countries whose populations add up to a total of almost one billion persons. Such an astronomical number of people can furnish virtually great hordes of military manpower and if we are to conserve our own forces, and actually if we are to survive, we must employ weapons of mass personnel destruction.

For this purpose, toxic agents cannot be surpassed for efficient coverage of large-area targets. The other day I was watching a Korean combat film and one of the shots showed a wooded mountainside known to hide a large number of enemy troops. Our artillery was blasting away methodically at this terrain, with bursts ranging up and down and across the entire side of the mountain. But I venture to guess that if our troops had attempted to take that mountain there would have been plenty of Reds still left to shoot them down. Now with gas it would have been

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a different story. Far less ammunition expenditure would have been required to blanket such a target with a killing concentration of gas, and the enemy casualties would surely have been tremendous since we know the Reds in Korea are poorly protected against gas, if at all.

One further thought on gas warfare and I am done. This concerns the statement made by some people that gas warfare is not humane. These people don't object to the use of hydrocyanic acid gas by some states, which consider this gas more humane than the electric chair for killing those sentenced to death for murder. And yet we cannot use hydrocyanic acid gas on the battlefield to kill our enemies, who would murder us if they had half a chance. It just doesn't make sense.

(Name Withheld)

Emeryville, Calif.

I have read with much interest the proposed editorial by Lt. Col. Harold B. Rodier and the comments of Colonel E. R. Baker. Although I find myself thoroughly in smypathy with their views, including the need of educating the general public and many of our political leaders in chemical warfare matters, I am fearful that those who are associated with chemical industries or with the Chemical Corps may be regarded by others as sufficiently biased as to seriously cripple the acceptance of their views by the general public and our political leaders. If we are to properly influence their thinking without being charged with war-mongering for profit, I feel that we should secure the aid of some high-calibre public relations experts and have them to work with us to convince prominent editors, authors and commentators without close ties with our chemical industry. The latter can then influence the public and their political representatives in an effective manner.

It is appalling to observe such confused thinking, public discussion and political activity as has developed in our nation within recent times! Have we grown too soft from the accumulation of wealth and of material comforts and pleasures that we can think only of ourselves and of our desire to perpetuate our comforts with minimum effort and cost? Have we lost the aggressive, pioneering spirit which characterized the founding and development of our Nation? One would think so by the continued drive for "security" and personal and group benefits in our domestic as well as foreign affairs!

I think it to be necessary that our public be educated to be less passively defense-minded and more offensively-minded toward the Communist nations. We should rise up in righteous anger and destroy them by every means at our command. Concurrently we should put our own house in better order, and to my mind that must begin at home. We are not properly united chiefly because we are divided into selfish groups who by lobbying, striking and other such maneuvers, aim to secure or to maintain special advantages at the expense of others. How can we destroy our external enemies until we become properly united? This is our major problem.

With respect to our methods of conducting warfare, I fully agree with Colonel Baker that owing to the disparity of respective manpower we can only expect to win against the Communist powers by fully utilizing the superior productiveness of our industry, technology and science. This means full scale use of chemical, bacteriological and radiological warfare in addition to older, more conventional means of warfare. Convincing arguments could be presented that these newer forms of warfare are actually more, rather than less, humane than older forms of warfare. While it may be advisable to convince our public of this, it is much more important that our public and our enemies as well be informed that we shall use every weapon at our command. Had we done this in Korea, our present situation would surely have been much improved.

T. F. BRADLEY, *President*
San Francisco Chapter

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BIOLOGICAL WARFARE

(Continued from Page 53)

An alert public health protection system is the keystone of our defense against biological warfare. If raids were quickly spotted and control measures promptly applied, the harm caused by BW attacks would be small.

But to make our defenses work, every citizen must back up the efforts of the organized health services. You must strive to keep your personal health at a peak at all times. You also must help to control all disease outbreaks that occur among people, livestock and field crops.

In the event of a BW raid, you must make every effort to keep germs and toxins from getting inside your body where they might cause harm. Always seek shelter and be sure to keep your body covered as much as possible. Never take chances with food or water that might be dangerous.

If you take these steps to help yourself, you will make the job of your public health experts much easier. Should BW ever come to America, your civil defense authorities will give you the facts about each attack and any special instructions you may need.

Remember: Don't listen to propaganda or scare-talk about how germs can wipe out a city. If you will cooperate with your neighbors and civil defense health authorities, America will be able to keep up a strong defense against biological warfare.

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